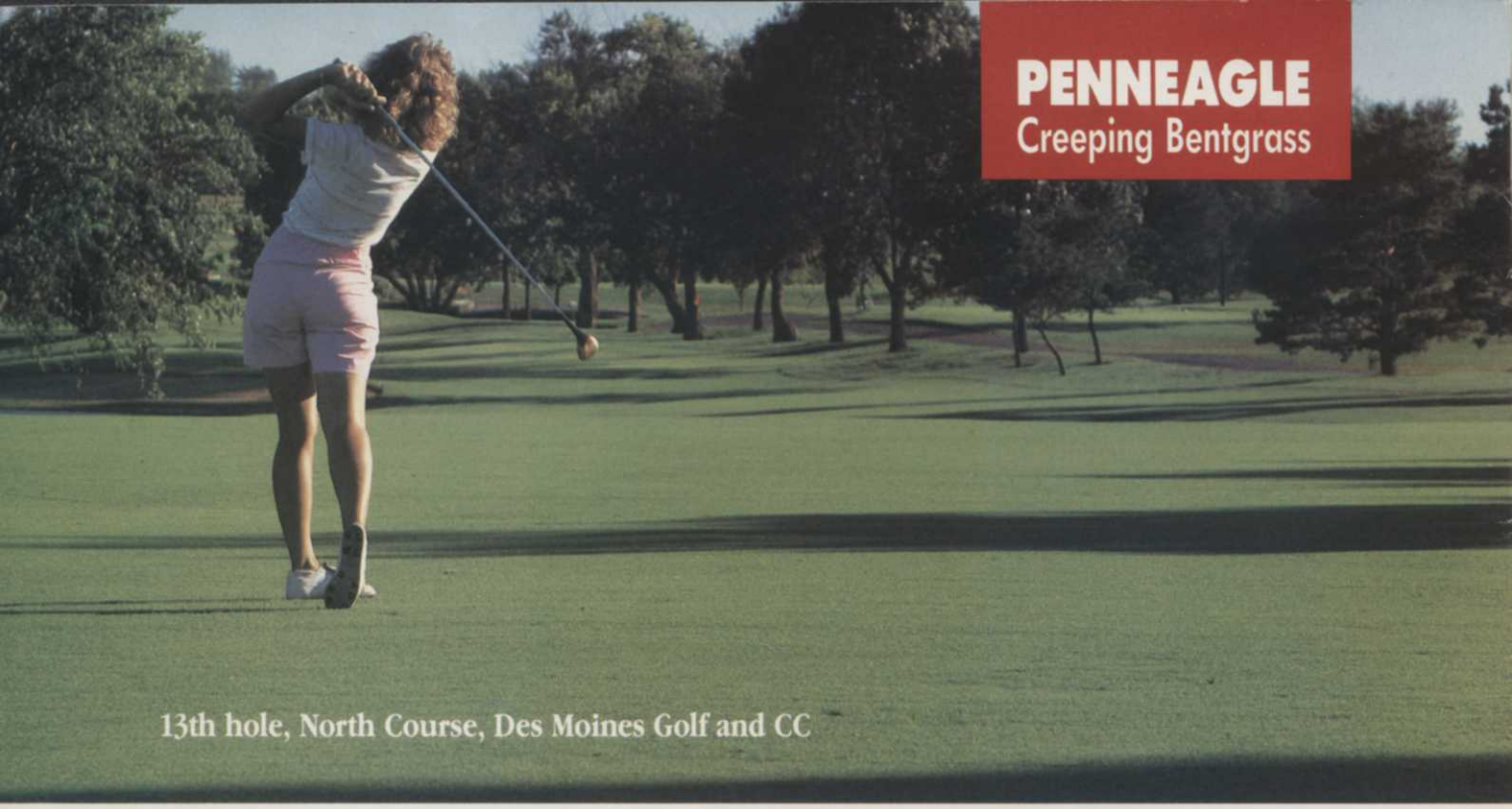
AN EDITED PUBLICATION

$2.50/AUGUST 1989

LANDSCAPE MANAGEMENT

FAIRWAYS OF THE FUTURE

also: late season fertilization



13th hole, North Course, Des Moines Golf and CC

"SINCE WE REPLACED OUR BLUEGRASS FAIRWAYS WITH PENNEAGLE, PLAYER SATISFACTION IS UP 500%"

Bill Byers completely renovated all 36 fairways at Des Moines Golf and CC over a period of three years ... nine in 1985, nine in 1986 and the remainder in 1987.

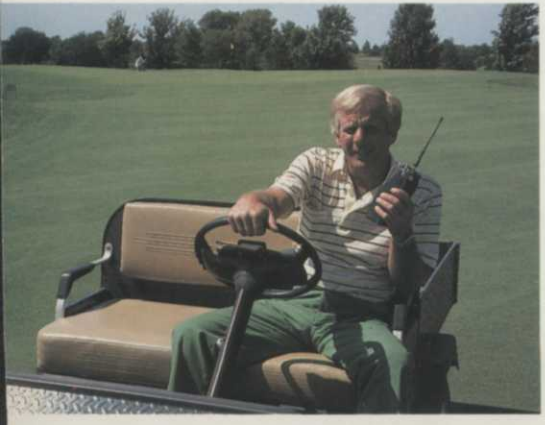
Three days after spraying the existing bluegrass/Poa annua fairways with a non-selective herbicide, Penneagle was slit-seeded into the surface. When play resumed in seven days, members had the option of playing from the germinating fairways or taking a drop in the rough.

Bill finds that lightweight mowing keeps the Poa population in control. "I used the clippings for garden mulch one year, that resulted in a terrific stand of Poa. This illustrates the effectiveness of removing clippings and seed heads."

Overall, the new Penneagle fairways require less water than trying to maintain the old bluegrass/Poa fairways, and Penneagle proved to be drought tolerant during the dry summers.

"Bentgrass fairways are in demand in our area. Other courses in Des Moines have made the switch," says Bill, "And we find that our player satisfaction is up 500%."

Bill Byers, CGCS
Des Moines Golf and CC, Iowa



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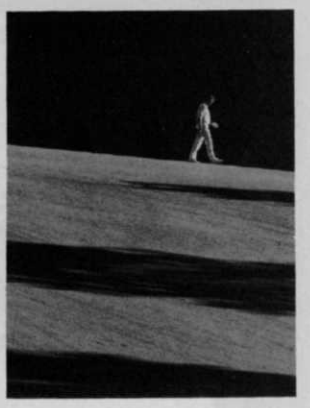
AUGUST 1989, VOLUME 28, NUMBER 8

LANDSCAPE MANAGEMENT



On the cover: The new generation of golf course fairways at Oakmont C.C.

by Larry Kassell

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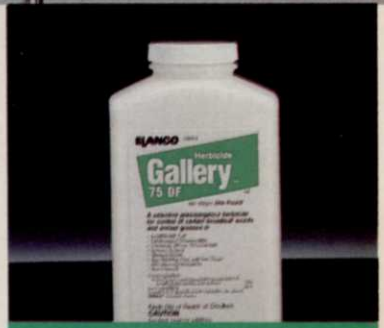

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AS I SEE IT...

Food for thought

As your stomach cells absorb the day's lunch, here are some interesting observations that should get your brain cells going, too.

● **Dr. Gerald Kidder** of the University of Florida believes that lawn and tree care companies should consider purchasing shredders. Why? "Instead of throwing away tree debris (leaves, pine needles, prunings, etc.), people can run that stuff through the chipper/shredder and produce decorative mulch," Kidder kids not. "I hope lawn care services will start using this technology and beautify the yards they serve with material they now throw away."

(which makes up nearly 20 percent of the state's municipal solid waste) will no longer be allowed in Florida landfills beginning in January, 1992. This is a trend which may touch landscapers in other parts of the country, especially highly-populated areas in states like New York, New Jersey and Pennsylvania.

Something to think about.

● The total herbicide market in the U.S. has leveled off, according to Kline & Company, an independent research company based in Fairfield, N.J. In a press release titled "Intense Competition and Mounting Environmental Concerns Ahead for U.S. Herbicide Suppliers," Kline noted that the U.S. herbicide market will increase 1 to 2 percent annually until the year 2000.

Non-crop herbicides, such as those in the turf/ornamental market, will experience the most rapid growth, the report said.

"Kline expects groundwater contamination will be the most critical environmental issue facing the industry in the 1990s," the press release noted. (That's the ag industry, not the landscape industry, I might note. Although groundwater concerns rank high in the agricultural community, they have not yet fully reached the landscape "community.")

So growth of herbicide use in the U.S. appears to be on "hold." Something to think about.

● Our congratulations to Dr. **Roy L. Goss** on his retirement from Washington State University. And another round of applause to him for establishing the Roy L. Goss Turfgrass Endowment Fund at his former school. Dr. Goss says that he will match each $15 donated with $1 of his own (with a ceiling of $10,000) for the next 12 months.

This is a noble and welcome gesture on Dr. Goss's part. He is to be commended.

Contributions may be mailed to 223 Hulbert Hall, W.S.U., Pullman, WA 99164. Monies collected will be used to support turfgrass research education and scholarships, according to development officer **Rich Swantz**.

Something to think about...until next month.

Jerry Roche

Jerry Roche, editor

LM

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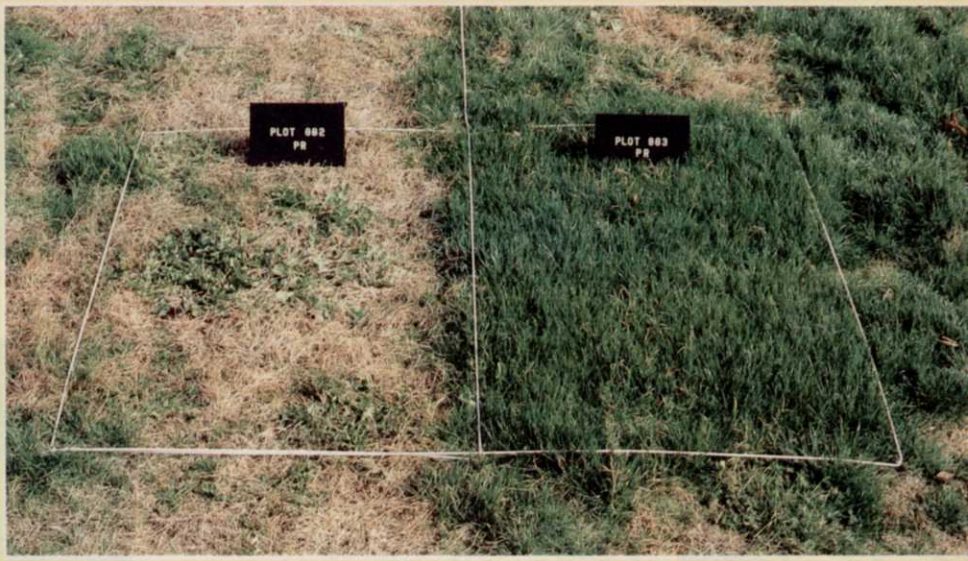

Left, insect damage in perennial ryegrass. Right, endophytic ryegrass resists insect pests.

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GREEN INDUSTRY NEWS

AUGUST 1989, VOLUME 28, NUMBER 8

LANDSCAPE MANAGEMENT

PESTICIDES

EPA gives its blessing to 'Confront' and 'Gallery'

'Campaign' and 'Avid' labels are expanded

WASHINGTON — Confront and Gallery herbicides have received registrations from the U.S. Environmental Protection Agency.

Confront is used for the control of annual and perennial broadleaf weeds in ornamental turf and cool-season grasses, according to the Dow Chemical Company. Gallery 75 dry flowable is approved for use on certain broadleaf weeds and annual grass in established turf.

The active ingredient in Gallery, a selective preemergence compound, is isoxaben. Among the 44 broadleaf weeds it is labeled for are chickweed, henbit, plantain, purslane, oxalis, spurge and white clover.

Gallery is stable on the soil surface, but must be activated by ½-inch of rainfall or irrigation within 21 days. Established turf can be reseeded in the fall after spring application.

Gallery is also labeled for use on trees, ornamental shrubs and ground covers.

Confront, a non-phenoxy, will be introduced in November, 1989.

Confront is composed of an amine salt formation containing one part clopyralid to three parts triclopyr per gallon. Both active ingredients act as a plant hormone mimic, disrupting plant cell growth, Dow says.

Initial control results are noticed four to six days after treatment, according to Rob Peterson, Dow's turf marketing manager.

Triclopyr controls ground ivy, oxalis, spurge, violets, chickweed and speedwell (among others), while clopyralid controls weeds such as musk thistle, clover, dandelion and plantain.

As action picked up at the EPA recently, the federal organization also expanded the labels of Campaign herbicide from Monsanto and Avid miticide/insecticide from MSD Agvet.

Campaign's new label allows it to be tank-mixed with Oust or atrazine, widening the window of application. The label also permits application in bahiagrass or tall fescue.

Campaign was used last year in the South for summer release of actively-growing bermudagrass. The new label allows the product to be used for:

- bermudagrass release in the spring prior to green-up;
- release of bahiagrass; and
- spring and summer applications in tall fescue.

Campaign is said to be especially valuable to roadside vegetation managers.

Avid is now approved for control of spider mites and leafminers on woody ornamental plants. Previously, the product had been registered for use on flower crops, foliage plants and other non-woody ornamentals.

Avid can also be used on such important nursery plant types as deciduous shrubs, groundcovers and vines, perennials, annuals and bedding plants. It has not been cleared for use on conifers, however.

For more information on these products contact:

- **Elanco Products Company** at Lilly Corporate Center, Indianapolis, IN 46285; (800) 352-6776 for Gallery.
- **Dow Chemical Company** at 9001 Bldg., Midland, MI 48640; (517) 636-1000 for Confront.
- **Monsanto Industrial Products Group**, Box M2L, 800 N. Lindbergh Blvd., St. Louis, MO 63167; (314) 694-6640 for Campaign.
- **MSD Agvet** at P.O. Box 2000, Rahway, NJ 07065-0912; (201) 574-4000 for Avid. □

Lofts expands

ALBANY, OR. — Lofts Seed Inc. recently expanded its facilities. Its West Coast division, Lofts/Great Western, has added more than 5,000 acres for turfgrass seed production. Storage and loading facilities have been increased by adding a new 33,000 sq.ft. warehouse (above) that holds 4 to 5 million lbs. of seed.

Landscaping giant John Moulder dies

GLENDALE, Calif. — John Moulder, who perhaps more than any one person took landscape construction in California from pick-and-shovel to organized business, died June 9 at Glendale Memorial Hospital.

He was 81.

In an exclusive interview with LANDSCAPE MANAGEMENT magazine two years ago, the landscape trailblazer revealed his secrets of success:

"Just doing good work isn't the answer," he told LM. "You have to think in terms of business. Many people go broke doing good jobs ...you can't have a boom one year and sit back and rest the next."

JOHN MOULDER: 1907-1989

John and his brother Paul founded Moulder Brothers Landscaping way back in 1937. By the company's 50th anniversary year, it had been built into a $20 million a year business, making it one of the biggest in Southern California — as well as the oldest.

Over the years, the Moulder Brothers touch has been brought to such diversified projects as Dodger Stadium, Disneyland's Bear Country, the Music Center, Sea World of Florida, large chunks of freeway systems and literally scores of parks, golf courses and other recreational facilities.

Moulder went into semi-retirement last year. "The planning has all been done for an orderly transition," Moulder told LM in the 1987 interview.

Moulder formed Earthmark Industries in 1987 and Moulder Brothers became a wholly-owned subsidiary. This would later facilitate a plan he had worked on for years whereby employees might be given an opportunity to purchase stock and, in time, to become owners of the company.

Duane Barlett is president of Earthmark Industries. "The John Moulder stamp will be on the company well into our second 50 years," says Barlett, adding, "and I suspect there will be John Moulder overtones somewhere when we celebrate our centennial."

Moulder was also active in the California Landscape Contractors Association (CLCA). "He was a dominant force in the association for many years," says CLCA executive director Sharon McGuire. "His leadership qualities and gusto made him a real gem in the industry."

Moulder was CLCA president in 1955. He became its first Sustaining Member in 1977 and a Life Member in 1981.

John Moulder is survived by his wife Claudine. Donations may be made in his name to the American Cancer Society. □

ATHLETIC TURF

Ohio State gridders will go back to natural grass

The move to natural turf by some major college and professional stadiums continues. Most notable of late is the decision by Ohio State University officials to install natural grass after the 1989 football season.

OSU officials decided in early June to make the switch. However, it's not yet known whether the field will be sodded or seeded.

Dr. Bill Pound, Dr. John Street and **Dr. Karl Dannenberger**, OSU turfgrass specialists, have met with college officials to offer their advice on which systems to incorporate into the new field.

"At this point, the only decision that has been confirmed is that they are going to natural grass," says Pound, though university officials are leaning toward seed. Pound says he and his associates believe sod is the best way to establish a 100 percent bluegrass field and avoid ryegrass conversion caused by overseeding.

Dr. Bill Pound

Arrowhead Stadium in Kansas City may also soon become a natural turf site in preparation for the 1994 World Cup Soccer tournament. **George Toma** reports that the decision will not be made until 1992. About 12 U.S. stadiums will play host to the games.

Toma spiffs up Japan

George Toma, grounds manager for the Kansas City Royals, was in Japan recently to check out the two practice fields which will be used by the Los Angeles Rams and San Francisco 49ers. The two teams play a National Football League exhibition game on Oct. 6 in the Tokyo Dome (which, by the way, is artificial turf). The practice fields are natural turf. Toma says one was resodded with Tifton 328 bermudagrass, the other with Japanese bermuda overseeded with common bermuda.

For more information...

To learn more about sports turf management, write the Sports Turf Managers Association at 400 N. Mountain Ave., Suite 301, Upland, CA 91786 or phone (714) 981-9199.

TURFGRASS

Turf-Seed bluegrasses tie for 1st in '88

BELTSVILLE, MD. — Midnight and Blacksburg tied for best overall cultivar in 1988 results of the National Kentucky Bluegrass Test. Both cultivars, which tied with mean scores of 6.4, are marketed by Turf-Seed Inc.

No. 1 cultivars at each test location were:

- Welcome in British Columbia with 6.1;
- Lofts 1757 and Able in Ventura, Calif. with 6.8s;
- Wabash with 6.7 in Washington, D.C.;
- Kenblue with 5.4 in Ames, Iowa;
- Glade with 8.3 in Post Falls, Idaho;
- Mystic with 7.2 in West Lafayette, Ind.;
- Blacksburg, Challenger and Able I with 7.3s in Manhattan, Kans.;
- Blacksburg with 8.4 in Wichita, Kans.;
- Wabash with 6.5 in Lexington, Ky.;
- Cynthia and Amazon with 8.7s in Winnipeg, Manitoba, Canada;
- Princeton 104 with 7.1 in Silver Spring, Md.;
- Princeton 104 with 7.8 in East Lansing, Mich.
- NE 80-88 with 7.3 in Columbia, Mo.;
- WW AG 496 with 7.0 (low mowing) in Lincoln, Neb.;
- Midnight, Eclipse and Aquila with 6.3s (high mowing) in Lincoln, Neb.;
- Princeton 104 with 7.4 (low nitrogen) in Adelphia, N.J.;
- Midnight with 6.9 (high nitrogen) in Adelphia, N.J.;
- BA 69-82 with 6.5 in Columbus, Ohio;
- Asset and Merit with 7.2s in Stillwater, Okla.;
- Midnight with 7.0 in Hubbard, Ore.;
- Blacksburg and Bar VB 534 with 7.9s in Kingston, R.I.;
- Blacksburg with 8.0 in Beltsville, Md.;
- Princeton 104 and Eclipse with 5.9s in Blacksburg, Va.;
- Blacksburg with 6.4 in Blackstone, Va.;
- Blacksburg with 8.3 in Pullman, Wash.;
- Princeton 104 with 7.9 in Puyallup, Wash; and
- America with 8.0 (dense shade) in Ritzville, Wash.

Cultivars which rated highest in each individual category (from more than one location) are shown in the adjacent chart.

The test is co-sponsored by the USDA and Maryland Turf Council. □

NATIONAL TURFGRASS EVALUATION PROGRAM
1985 Kentucky Bluegrass Test
1988 Progress Report

	#1	#2	#3	#4	LSD
Mean score	Midnight Blacksburg (6.4)		Princeton 104 (6.3)	Asset Eclipse (6.2)	0.2
Spring green-up	Freedom Wabash (5.5)		NE 80-88 (5.4)	Rugby Huntsville (5.3)	0.7
Genetic color	Midnight (7.5)	Destiny WW AG 468 (7.1)		Amazon America (7.0)	0.4
Winter color	Nassau (4.2)	Tendos Chateau Bristol HV 97 (3.8)			0.9
Spring density	Asset (7.5)	Cheri Compact (7.2)		Blacksburg Cynthia Ram I (7.0)	0.8
Summer density	Asset Annika Chateau Mystic (7.3)				0.8
Fall density	Blacksburg (8.3)	Cynthia (8.2)	Bar VB 534 Midnight Wabash (8.1)		0.6
Drought tolerance	Ram I (8.7)	Blacksburg Challenger (8.3)		9 tied with (8.0)	1.7
Melting out resistance (spring)	Princeton 104 (7.8)	Liberty (7.7)	Ikone (7.5)	BA 73-540 Destiny Glade (7.3)	1.1
Leaf spot resistance	Princeton 104 (6.5)	BA 69-82 Merion (6.0)		A-34 (5.8)	1.0
Dollar spot resistance	WW AG 495 (6.3)	Wabash NE 80-88 Asset (5.3)			1.1

LEGISLATION

Burn proposals fail in Oregon

SALEM, Ore. — The turfseed industry scored a victory in June when the Oregon House of Representatives defeated a bill to restrict and eventually eliminate field burning.

The bill died in the House Environment and Energy Committee due to summer recess.

The bill would have limited field burning to 150,000 acres a year, with an additional 100,000 acres allowed to be burned using propane (said to be less polluting). Eventually, field burning would have been eliminated.

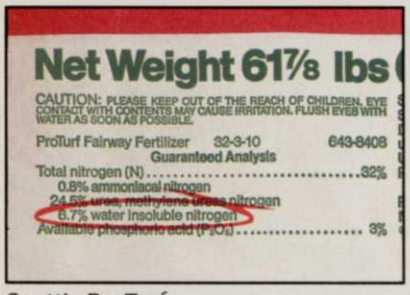
Dave Nelson, director of the Oregon Seed Council, credits intensive lobbying for the victory. "Beyond that," says Nelson, "the arguments for the phase-out of field burning were not strong enough. Six years does not allow enough time for biological research to become an effective replacement."

Despite the victory, Nelson says field burning this year will be as restricted as possible and closely monitored by anti-burn groups and government officials.

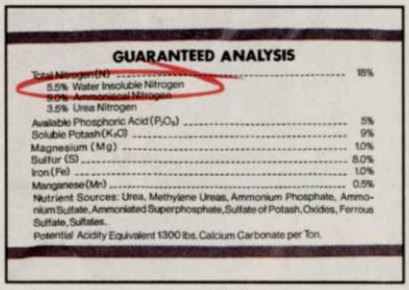
Jack Zimmer, director of grower services for Jacklin Seed Co., says the issue is far from over. "Come fall, there's going to be numerous petitions submitted by various groups to do everything they can to establish a phase-out (of burning)."

Craig Edminster, director of research for International Seeds, Inc., envisions some problems down the line, "because I think it'll go to ballot. We believe strongly that we're going to win out, but it's going to cost us." □

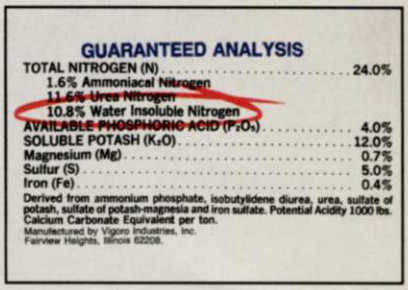
READ ...the fine print.


Net Weight 61⅞ lbs
CAUTION: PLEASE KEEP OUT OF THE REACH OF CHILDREN. EYE CONTACT WITH CONTENTS MAY CAUSE IRRITATION. FLUSH EYES WITH WATER AS SOON AS POSSIBLE.
ProTurf Fairway Fertilizer 32-3-10 643-8408
Guaranteed Analysis
Total nitrogen (N) 32%
0.8% ammoniacal nitrogen
24.5% urea, methylene urea nitrogen
6.7% water insoluble nitrogen
Available phosphoric acid (P2O5) 3%

Scott's ProTurf


GUARANTEED ANALYSIS
Total Nitrogen (N) 18%
5.5% Water Insoluble Nitrogen
9.0% Ammoniacal Nitrogen
3.5% Urea Nitrogen
Available Phosphoric Acid (P2O5) 5%
Soluble Potash (K2O) 9%
Magnesium (Mg) 1.0%
Sulfur (S) 8.0%
Iron (Fe) 1.0%
Manganese (Mn) 0.5%
Nutrient Sources: Urea, Methylene Ureas, Ammonium Phosphate, Ammonium Sulfate, Ammoniated Superphosphate, Sulfate of Potash, Oxides, Ferrous Sulfate, Sulfates.
Potential Acidity Equivalent 1300 lbs. Calcium Carbonate per Ton.

Lebanon Country Club


GUARANTEED ANALYSIS
TOTAL NITROGEN (N) 24.0%
1.6% Ammoniacal Nitrogen
11.6% Urea Nitrogen
10.8% Water Insoluble Nitrogen
AVAILABLE PHOSPHORIC ACID (P2O5) 4.0%
SOLUBLE POTASH (K2O) 12.0%
Magnesium (Mg) 0.7%
Sulfur (S) 5.0%
Iron (Fe) 0.4%
Derived from ammonium phosphate, isobutylidene diurea, urea, sulfate of potash, sulfate of potash-magnesia and iron sulfate. Potential Acidity 1000 lbs. Calcium Carbonate Equivalent per ton.
Manufactured by Vigoro Industries, Inc.
Fairview Heights, Illinois 62208.

Par Ex

Down in the analysis area on every fertilizer bag, you'll find the "fine print" that tells you what the big print doesn't. Read all of it. Carefully. But most importantly, look at the percentage of Water Insoluble Nitrogen.

Water Insoluble Nitrogen (WIN)... the key to superior turf.

The higher the WIN percentage, the longer your turf will remain green. And the less often you will have to fertilize. That's because WIN is the percentage of total Nitrogen that is truly slow release. Freeing small amounts of Nitrogen each time it's touched by water (Par Ex® with IBDU®) or activated by temperature or bacterial action (competitive products).

No competitor can deliver as much usable WIN as Par Ex.

Only Par Ex contains IBDU—a unique Water Insoluble Nitrogen source that is 100% available to your turf in a single growing season. Consider that urea formaldehyde products (bacteria and temperature released) contain about one third of their WIN in the form of plastic polymers. Its long-term Nitrogen release is so slow, it's almost useless, and will most likely occur during the hottest periods, just when you don't want it.

For Sulfur Coated Urea (SCU), research has shown that by the time it is spread, about 50% is immediately soluble, effectively doubling your cost of controlled-release Nitrogen and cutting the benefit in half!

Be sure to read your bag.

If the percentage of Water Insoluble Nitrogen isn't listed, there isn't any slow-release Nitrogen. If it *is* listed, chances are it won't be as high as the WIN percentage in Par Ex. Even if it is, we guarantee you that 100% of what we list as WIN is available to your turf every growing season. That means for every six months of growing, you'll receive an additional 46-53% more usable WIN than our competitors can deliver.

So start building your WIN percentage today. Talk to your local Par Ex Representative or call 813/294-2567. And get all the WIN you've been reading about.

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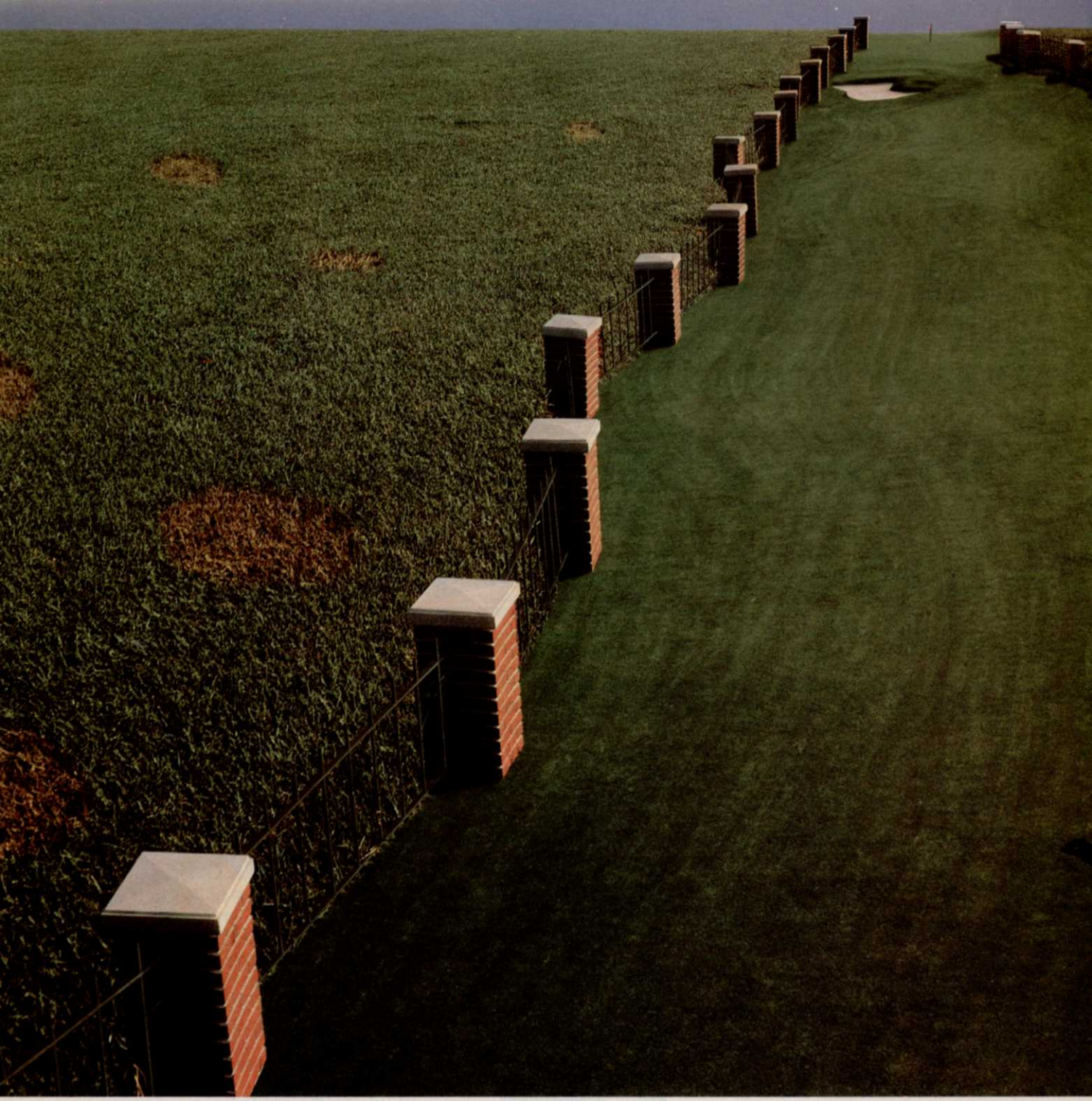

Keep your fairways looking great.

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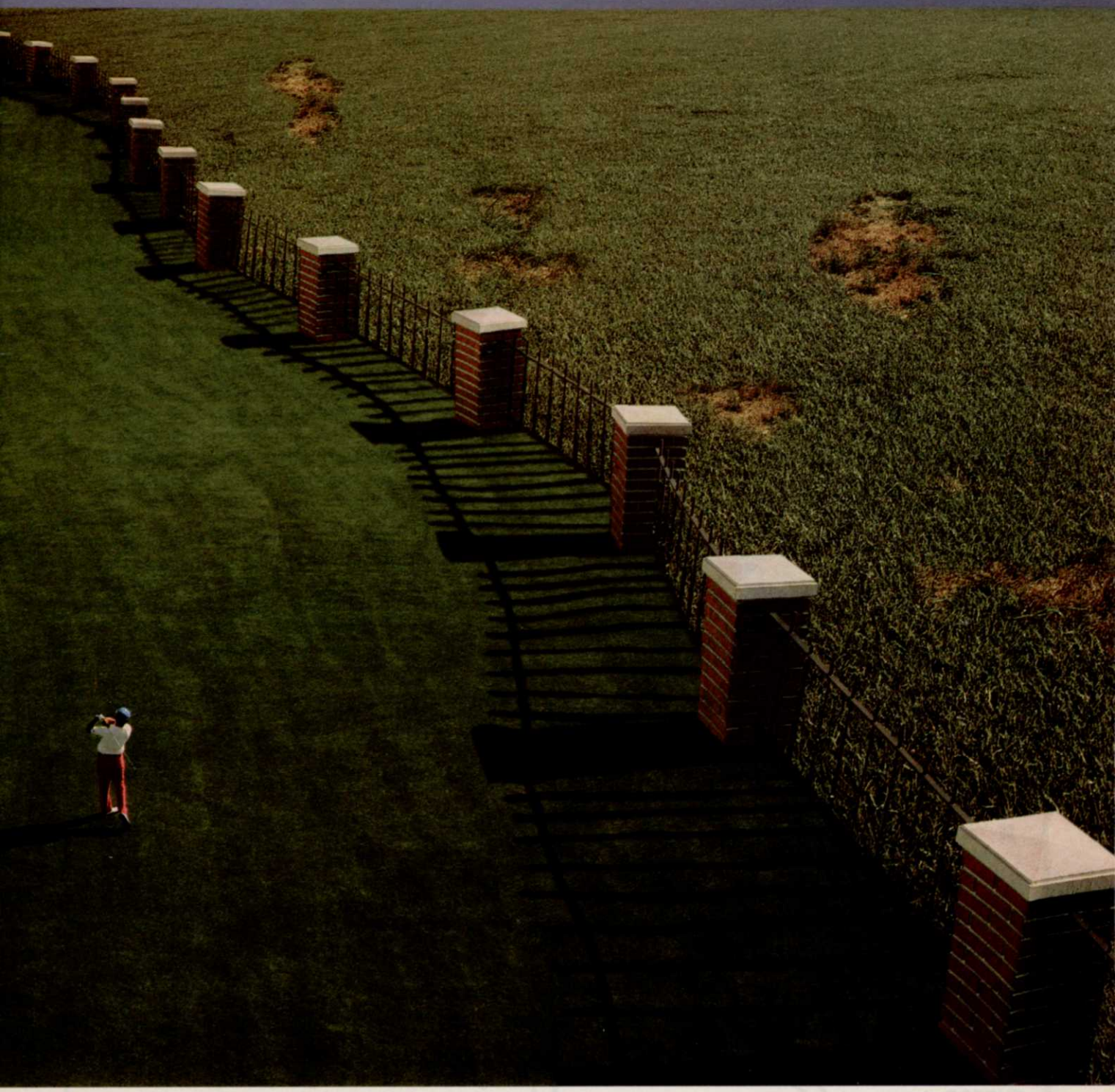

Golfers love to play on beautiful fairways. It's that simple. Which is why it's so important to keep your course in top shape. That means controlling diseases like dollar spot and anthracnose. And that means a program using BAYLETON® fungicide.

BAYLETON is taking care of more and more beautiful fairways because more superintendents are discovering how long it lasts. How much they save in application costs by making fewer applications. And how good it makes them and their fairways look.

BAYLETON. Because golfers play favorites. For more information, contact Mobay Corporation, Specialty Products Group, Box 4913, Kansas City, MO 64120.

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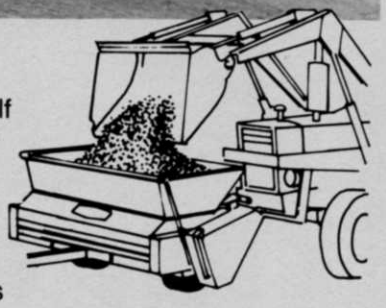
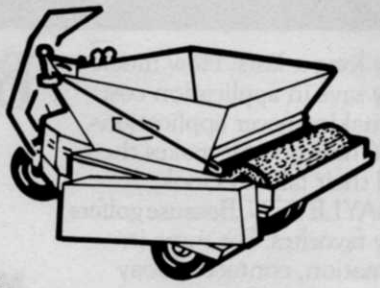
TURFCO METE-R-MATIC II

TOW-TYPE TOP DRESSER

Top dressing **levels existing turf** on athletic fields while stimulating growth and improving soil conditions. Repetitive top dressing **fills in the low spots** and also promotes the **decomposition of thatch.**



- Top dress 18 golf greens in under 6 hours
- Top dress an athletic field in under 2 hours
- 18.3 cubic feet hopper capacity
- Spreading width of 60"
- Top dress at up to 8 miles/hour
- Ground driven no engine to maintain



TURFCO also manufactures self-propelled and truckster-mounted **METE-R-MATIC TOP DRESSERS**

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Minneapolis, MN 55412-2688

Ph. 612/588-0741
Telex 5106013762

TURFCO

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SHORT CUTS

SMALL BUSINESS SUMMIT...Ron Kujawa, president of the Associated Landscape Contractors of America, recently participated in a meeting with Pres. George Bush. The day-long affair was sponsored by the Small Business Legislative Council. "I was attending as president of the Associated Landscape Contractors of America, not Ron Kujawa," the owner of KEI Enterprises notes. "I was a very lucky and fortunate person to be part of it." Pres. Bush gave a 40-minute speech to 100 people assembled in the East Room of the White House. Also speaking was Secretary of Commerce Robert Mossbacher. Says Kujawa: "I went away feeling very confident that our country is in good hands. President Bush is a man of his word...a person who has very deep feelings about loyalty, honesty and service. These are things that are sorely lacking in Washington."

TEACH 'EM ABOUT TURF...says **Rich Hurley**, research director at Lofts Seed Inc. Hurley told attendees at Lofts' 1989 Field Day that even the best turf products need to be managed properly to succeed. "It gets back to education, it gets back to knowing your business. It's really a package deal. It's educating yourself and your crew. It's using quality products and getting your point across to your consumers, whether you're dealing with a golf course greens committee, homeowner or sod buyers. Education is key."

NEW DIGS IN OREGON...for Pennington Seed, which dedicated its Lebanon, Ore., turfseed facility in June. The 40,000-square foot plant is located on a railroad line that can handle 400 rail cars (56 million pounds) of seed per year. The company may need that many if its new Cheyenne bermudagrass, developed by Dr. Judy Brede of Jacklin Seed Co., takes off as expected.

AMERICA IS HYSTERICAL...over a product that has been used for several decades and might cause harm only if a wheelbarrow full of apples were eaten daily, says **Jim Wilkinson**, director of environmental affairs for the Professional Lawn Care Association of America. "I'm afraid the Natural Resources Defense Council will go after the charcoal industry when they find out that a single serving of charbroiled steak is, maybe, a thousand times more toxic than all the Alar-treated apples I ever hope to consume. Then, there goes my Sunday cookout."

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When Surface Pests are at their worst, PROXOL® works best

Surface-feeding sod webworms, armyworms and cutworms don't stand a chance when PROXOL® 80SP is on the job. It's as easy to apply as a spray and has no unpleasant odor.

Fast-working PROXOL readily penetrates thatch to control grubs. Yet it has no long-term residual build-up in the soil.

For a complete information kit on nourishing and protecting your turf, including a comprehensive guide on turf insect control, join the NOR-AM Turf Management Program. Write to the Communications Department, NOR-AM Chemical Company, 3509 Silverside Road, P.O. Box 7495, Wilmington, DE 19803.

IMPORTANT: Please remember always to read and follow carefully all label directions when applying any chemical.

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Introducing Cutless.®

A new kind of turf growth regulator that gives your course a bottom line boost:

More playability.

This is where perfect lies start on your fairway. New Cutless 50W from Elanco.

Unlike other turf growth regulators, new Cutless doesn't stop the development of warm and cool season turfgrass. Instead, it reduces or slows your turfgrass's growth rate by shortening the internodes of the growth stem with no adverse effects on their roots. The result is improved turf quality and more playable fairways.

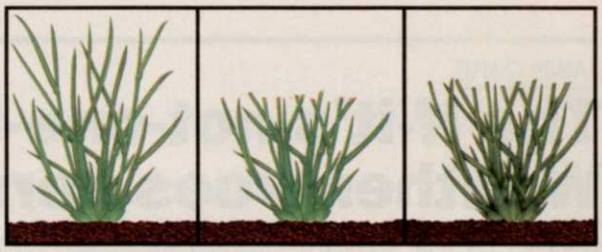
With Cutless, your turfgrass appears thicker and stronger for a denser, more consistent playing surface. Golf balls just naturally sit up better.

Cutless also reduces your water use, resulting in less turf wilt. And lower irrigation costs.

But Cutless does more than that. Much more. It also gives your turf a rich, darker green color.

Because Cutless-treated grass grows at a slower rate, there's also a dramatic reduction in clippings. Up to 50% less. With less mowing frequency. Also up to 50% less. You not only save time and labor costs, you can also manage your hard-to-mow areas more efficiently.

Here's another added benefit with Cutless. As your turfgrass grows up thicker and more competitive, there's less room for troublesome weeds to interfere. Cutless also helps crowd out *Poa annua* for conversion to a more desirable turfgrass such as bentgrass.



1. Sprig of grass in normal state.
2. Seven to 10 days after Cutless application, mowed sprig sometimes exhibits slight discoloration of treated area and leaf tip browning.
3. Growth reduction peaks between third and eighth weeks, accompanied by darker green coloration and increased tillering.

Don't just take our word for Cutless. Take it from Scott Niven:

Scott Niven
Superintendent, Stanwich Club
Greenwich, Conn.

"I've reduced clippings 30 to 50% when we mow fairways. My guys don't have to empty the baskets as much, so we save time and money on labor. But I think the best advantage is the reduction in the amount of water you have using Cutless. It's a marked difference.

"Initially, you get so little discoloration with Cutless that a golfer would never notice it. But after 4 weeks, the difference was between night and day on how dark green the Cutless turf was.

"Cutless helped us convert from 80% Poa annua *to over 95% bentgrass within five years. But I'm just as impressed with how Cutless creates a much thicker turf. It makes the grass as tough as nails, helps the ball sit up higher for our golfers."*

Find out more about giving your course more playability with Cutless. See your Elanco distributor. Or for a free brochure, call toll-free: **1-800-352-6776.**

Elanco Products Company
A Division of Eli Lilly and Company
Dept. EM-455, Indianapolis, IN 46285 U.S.A.
Cutless®—(flurprimidol, Elanco)

Circle No. 111 on Reader Inquiry Card

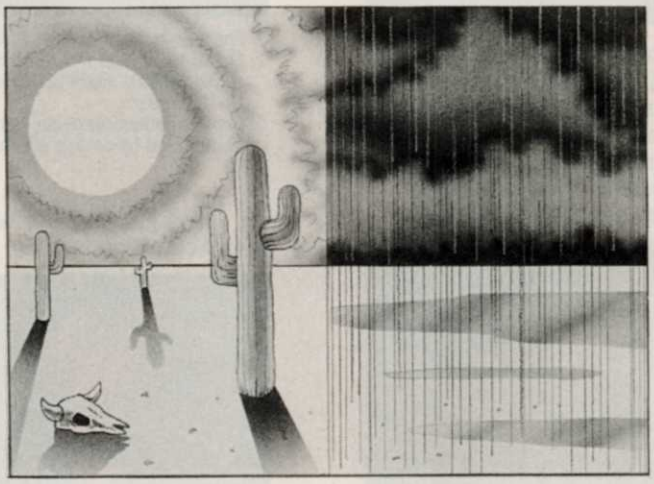
LAWN CARE

The If-it's-not-one-thing Department: Weather woes persist in parts of nation

MARIETTA, Ga. — With some states experiencing the continuing drought begun last year and other states encountering too much rain, lawn care operators are faced with a potpourri of problems this summer.

"LCOs in the dry areas are trying to overcome the problem by overseeding with drought-resistant grass varieties," reports Dr. Jim Wilkinson of the Professional Lawn Care Association of America. "They are also offering aeration services in order to better use the limited water allowed for sprinkling."

People trying to grow nice lawns in areas having heavy rains like most of the



Northeast are having their own special problems. "These folks are battling weeds," says Wilkinson. "The rain has diluted a lot of the weed management materials that would usually have lasted for a longer period were it not for all the water."

Wilkinson says that the excess rain in certain parts of the country is having a worse effect than last year's drought. "It's hurt," he notes. "From the people I've talked to, sales are not up to what they thought they should be. There were more positives to the drought last year (aeration, verticutting, etc.) than the rain this year."

Wilkinson also notes that conditions for crabgrass germination—again, especially on the East Coast—have been optimal this year. LCOs should plan on purchasing and using more post-emergence herbicides to control crabgrass than in previous years, he suggests. □

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Because time is money, the Lawnaire 28 is designed to cover big jobs quickly — up to 24,000 sq. ft. per hour. But because not every job is big, it's also compact and maneuverable. Just 34 inches wide, the Lawnaire 28 easily fits through yard gates. The unique tricycle front wheel gives the unit a zero turning radius while aerating!

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COVER STORY

FAIRWAYS OF THE FUTURE

Issues and societal forces at work today are changing the look and management of tomorrow's golf courses. Equipment manufacturers say they'll be ready for the 21st century.

by Will Perry, managing editor

In many ways, the golf course of tomorrow is being shaped by the issues facing the green industry today. Concern about water conservation, dwindling employee pools, and the ever-increasing number of recreational golfers are some of the factors dictating what courses—and the equipment used to manage them—will look like in the future.

What will be the consequences of these developments for the superintendent in 5, 10, 20 years? LANDSCAPE MANAGEMENT asked around.

"There's no question that the big issue for the next 10 to 20 years is water," says **Dr. Michael Hurdzan**, of Hurdzan Design Group, a golf course architectural firm. "Everything else will be driven off of the limitation of that resource."

Hurdzan believes that the recent appearance of meters on wells in many parts of the country is an early indicator of what lies ahead: increased monitoring. As controls tighten, water will become more expensive and, consequently, used more sparingly.

"I think that we'll start to see more zonal maintenance. Intensively maintained tees and greens, moderately maintained fairways, low maintenance roughs and a lot more 'no maintenance' areas." he says.

Hurdzan echoes the sentiments of several architects who believe that tomorrow's superintendent is likely to rely more on super-absorbant polymers to supplement irrigation. Drip irrigation will grow in favor, they say, while soil and air sensors and fully-computerized weather stations will be commonplace.

"The big effort in computer-controlled irrigation will continue to be trying to fine tune each sprinkler head," says **Ed Hunter**, researcher and product developer for Hunter Industries. Sprinklers will have to be more consistent and effluent water will become more of a factor, he adds. "If water gets expensive enough, they'll put up with a lot more dry spots."

A place for bent

Will high maintenance turfgrasses be on the chopping block? "Some grasses that have the ability to get by without water will come into play," says Hurdzan. "Subsequently, bentgrasses, though they may remain the

Three ways Mazda trucks outperform the competition.

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If you're about to commit your company's resources to building a truck fleet, you've probably looked at Ford Ranger, Chevrolet S-10, Toyota and Nissan. But your shopping list isn't complete until you've taken a good look at Mazda. Because Mazda trucks offer some very important advantages over the competition.

Mazda trucks: Number one in overall customer satisfaction for three straight years.*

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FORD RANGER #9	FORD RANGER #9	CHEVROLET S-10 #10

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Mazda trucks: Offer the most truck for your money.††

Standard Features	Mazda B2200 Base	Toyota Standard	Nissan Standard	Ford Ranger "S"	Chevrolet S-10 "EL"
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Automatic transmission	Optional	N/A	Optional	N/A	N/A
Double-wall cargo bed	Standard	Standard	Standard	Standard	Standard
Tinted glass	Standard	Optional	N/A	Standard	Optional
Steel-belted radials	Standard	Standard	Standard	Standard	Standard
Full carpeting	Standard	N/A	N/A	N/A	N/A

To find out even more ways Mazda outperforms the competition, contact:
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†† Comparisons with other makes based upon available competitive data.

mazda

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The new generation of golf course fairways, shown above may include advanced bentgrass cultivars like this stand of Pennway at Oakmont Country Club.

grasses of choice, may not be practical on fairways 20 years from now."

Says architect **Rees Jones**: "Adequate water, particularly in the Northeast, will be the key. With the irrigation systems we have now, we can keep almost any grass alive anywhere on the course."

Hurdzan believes architects can be more responsive to calls for water conservation by taking a closer look at weather elements and their effect on the course. "I think we'll become more concerned with things like wind and trees than we have in the past. We'll re-route or change the way we orient fairways to cut down on the amount of evaporation," he says.

Drainage will take on increased significance, adds Jones. "In the old days a heavy rain would knock out golf cart rentals for at least a day or two. Today, with the drainage systems we have, there's almost no delay at all. And they're only going to get better."

Tough pars, easy bogeys

Golf car rentals will increase too, says **Jerome Hutchinson**, president of Turf Specialists Corp. in Holbrook, N.Y. Already an established source of income, they'll become even more common with the changing face of the American golfer.

"Golf course designers will have to cater to the older players, those who have retired early," says Hutchinson. "The aesthetics of the course will change a great deal in response to the number of female golfers on the scene. We'll see more flowers, water fountains—things like that. Courses will take on more of an arboretum look than practical golf."

Notes **Myrtle Feldmann**: "We are seeing more and more golfers and more use of carts, even on wet grasses." Feldmann is vice president of Feldmann Engineering and Manufacturing Co. "Playing on wet turfgrass causes increased compaction, which will result in a greater need for regular, programmed aerification on roughs and fairways, green collars and the edges of tees."

All the aerifying may be taking place at 2 a.m., says Hutchinson. "In heavy residential areas, like here in New York City, courses will be lighted. Not just so people can play at night, but so a lot of maintenance like cutting fairways and aerating can be done when it doesn't interfere with play."

Indeed, some companies are coming out with aerators specifically designed for large areas (fairways and roughs), like a new 10-foot unit just released by Cushman.

Hutchinson, whose company specializes in athletic field construction and drainage, also believes superintendents will rely more on subsurface irrigation and polymers.

Keep 'em light

Equipment manufacturers agree that the trend toward lightweight mowers will continue. Their increasing sophistication will make them more productive. Water-cooled, electric engines with full hydraulics will replace belt- or chain-driven machines. "I see built-in computer components that monitor engine function, oil pressure, temperature, rpm; even liquid displays that tell you when it's time for routine maintenance," says Toro's **Denny Brown**. "Now that the automotive industry and agricultural industries are beginning to incorporate these things, they'll become more cost effective."

A significant problem on the horizon, in addition to water availability, is the country's lack of adequate landfill space, says Brown. Future superintendents will have to find an alternate, affordable means of disposal as state after state bans clippings from these sites.

"We're going to see a real problem with clippings disposal in the '90s," adds **Bill Kinzer**, product man-

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ager for Jacobsen.

What party to cater?

What we need to be keying on, says **Helmut Adam**, president of Ransomes, is who the builders and designers will target in the future. "There are public, privately-owned public, municipal, country club and tour courses out there. Which market the industry decides to build for will have a drastic impact on the type of machinery we'll see in 20 years."

Adds Kinzer: "The National Golf Foundation (NGF) says we're going toward more and more public golf courses." In 1931, 78 percent were private. By the year 2000, 72 percent will be public. In 70 years, the golf course industry has reversed itself from a private to public entity. "Golfers today are going almost tee to green on manicured turf," says Kinzer. "Today we have scaled down, more contoured fairways where 'target golf' is played. Twenty-five years ago a superintendent had 80 acres of fairways. Today they have anywhere from 22 to 35 acres that are actually mowed as fairways. It's treated as a highly formalized piece of turf."

The reduced acreage allows superintendents to cut back on watering and fertilization.

"Generally speaking, you want an open golf course that players can get through," says Kinzer. "I think there's a middle ground between today's highly contoured, target golf courses and tomorrow's municipal course."

Yet there are doubts.

"There's still a real question in my mind as to where the real growth will be," says Adam. "It's obvious that there's a greater demand than supply, which should bode well for the industry."

If the industry leans toward the municipal course, which Adam believes it should, equipment sophistication will develop more slowly. Cost and maintenance standards will be key. If, however, the country club market is targeted, things will happen quickly. Says Adam: "I think a mistake that's often made is that we think of the golf course market as one entity. It's not.

"The premium courses out there continue to set higher and higher standards until we get to the point where fairways are managed like greens. Supers need the equipment to provide that type of finish. Yet we have to satisfy the needs of the public course. The successful companies of morrow will be those that can offer a broad spectrum of equipment to satisfy both."

Adam pulls out no stops when he describes tomorrow's equipment. Mowers that cut with lasers have been looked at by researchers in Texas, and unmanned equipment is only a matter of time.

"You'll be able to take a picture of a fairway, program it into a computer, and have it go out there and follow the contour of the course. One person could monitor several machines by remote control, or it could go by itself."

Adam says the size of the market will determine how soon this type of technology is applied. After all, he points out, it doesn't make sense for someone to invest $500 million in a market that has $50 million in total sales.

"Our industry is simple in terms of the level of machinery sophistication right now," says Adam. "But I think with the age of computerization and robotics growing and we see technology taking the leaps it has been taking the last 20 years, we'll soon have very inexpensive components that we can add to our machines to make them that much more efficient and easy to operate." **LM**

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With Olathe Slit Seeders you: • use less seed • get higher germination rates • have a healthier root system • thin out thatch and undesirable species • provide safer turf for sport areas • achieve the most important goal in over-seeding, namely, seed to soil contact.

MODEL 85 — 5 hp Seed 'n Thatch, low cost combination thatcher/seeder.

MODEL 84 walk-behind slit seeder, 18 hp, self propelled.

MODEL 37/38 for tractors in 16-25 hp range, bare dirt capabilities with dual feed hopper.

MODEL 83/93 — 4' PTO model for tractors 25 hp and up. In 1962, Buck Rogers built the first Rogers Slit Seeder. Now, in 1989, he has improved and expanded on his original ideas under the Olathe trademark.

Write or call your local Olathe/Toro dealer for information.

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Handle your grub situation fast, before things get really ugly.

At the very first sign of grub damage, apply DYLOX® insecticide. Nothing kills all species of white grubs faster. Within hours, the grubs are dying and the turf is recovering.

When grubs threaten, act fast. Use DYLOX. And turn an ugly little problem into a lot of beautiful turf.

For more information, contact Mobay Corporation, Specialty Products Group, Box 4913, Kansas City, MO 64120.

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Containers provide a quick-and-easy planting method that is often easier and less expensive than planting into a soil of dubious quality. Still, temperature fluctuations can threaten a plant's survival.

CONTAINERS: BEWARE WINTER ROOT INJURY

Planting boxes can create more problems than they were intended to solve. Choosing the right size and location is essential to keeping plant material healthy.

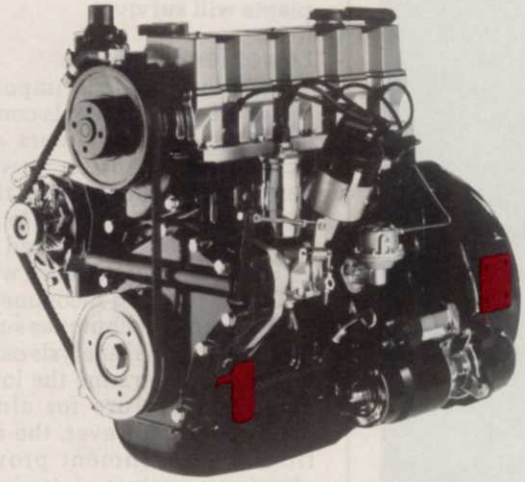
by Jim Borland

With increasing frequency, landscape plants are finding their way into totally artificial environments. One of these is the permanent planting box or container.

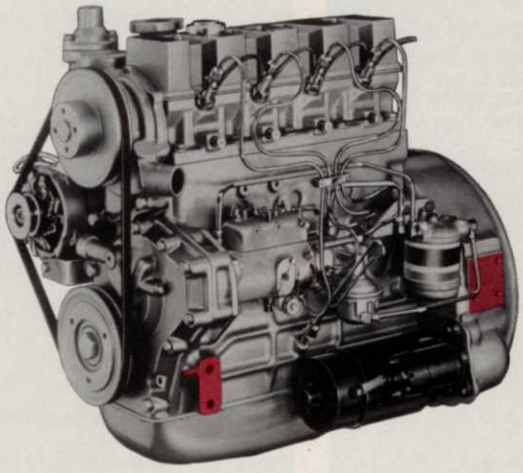
This practice is becoming more common as city planners try to beautify public areas with a variety of trees, shrubs, flowering annuals and perennials. This quick-and-easy method is often less expensive than planting into a soil of dubious quality. An additional benefit is that you don't have to tear up concrete or asphalt, under which vegetation control chemicals may have been applied.

Planting containers also help the landscape architect better achieve automobile traffic control, pedestrian traffic control and special aesthetic effects.

REDUCE THE MOUNTING COSTS OF ENGINES.



TM27—Gasoline, LPG, Natural Gas



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Seems like different fuel options always add to the expense of mounting an engine on your equipment.

Not if you use Continental TM engines.

As you can see, all our engines—gasoline, diesel, LPG and natural gas—come with identical mounting points. Which cuts down on design hours and dollars spent coming up with multiple configurations for your new applications.

Plus you'll gain power when you install one of our 24-80 hp Continental TM engines. Instead of being a glorified car engine, it's specifically made for industrial use. With, for example, an extra main bearing to support crankshaft torque.

So it can stand up to heavy industrial torture.

Power. And flexibility. Get more of both (not to mention less expenses and design headaches) when you choose Continental TM engines for your equipment.

How's that for cutting your costs?

Continental RED SEAL

More power to you.

©1989, Teledyne Total Power

Circle No. 145 on Reader Inquiry Card

TEMPERATURE GUIDE

AVERAGE KILLING LOW TEMPERATURES:

Species	Killing Temperatures (°F)
Acer palmatum 'Atropurpureum'	+14 (roots)
Agrimonia pilosa	+14 (buds); +18 (rhizomes); +23 (roots)
Anaphalis margaritacea	+18 (buds); +18 (rhizomes); +18 (roots)
Artemisia japonica	+10 (buds); +10 (rhizomes); +10 (roots)
A. montana	+14 (buds); +18 (rhizomes); +18 (roots)
Buxus sempervirens	+15 (roots); +27 (immature roots)
Chamaele decumbens	+23 (buds); +23 (rhizomes); +23 (roots)
Cornus florida*	−6 to −22 (twigs); +21 (immature roots); +11 (mature roots); +20 (roots)
Cotoneaster adpressa var. praecox	+10 (roots)
C. dammeri	+23 (immature roots)
C. horizontalis	+15 (roots)
C. microphyllus	+25 (immature roots); +9 (mature roots)
Cryptomeria japonica	+16 (roots)
Cytisus praecox	+15 (roots)
Daphne cneorum	+20 (roots)
D. pseudo-mezerum var. jezoensis	−4 (buds); −18 (leaves); +23 (roots)
Euonymous alata 'Compacta'	+19 (immature roots); +7 (mature roots)
E. fortunei var. radicans	−4 (buds); −4 (leaves); +14 (roots)
E. fortunei 'Argenteo-marginata'	+15 (roots)
E. fortunei 'Carrierei'	+15 (roots)
E. fortunei 'Colorata'	+5 (roots)
E. fortunei var. vegeta	+23 (immature roots); +12 (mature roots)
E. kiautschovica	+21 (immature roots); +16 (mature roots)
Hedera helix 'Baltica'	+15 (roots)
Hypericum spp.	+23 (immature roots); +18 (mature roots)
Ilex cornuta 'Dazzler'	+25 (immature roots); +18 (mature roots)
I. crenata 'Convexa'	−22 +20 (roots)
I. crenata 'Helleri'	+23 (immature roots)
Illex crenata 'Hetzii'	+20 (roots)
I. crenata 'Stokesii'	+20 (roots)
I. glabra	+15 (roots)
I. X meserveae 'Blue Boy'	+23 (immature roots); +9 (mature roots)
I. 'Nellie Stevens'	+23 (immature roots); +14 (mature roots)
I. opaca	+23 (immature roots); +9 (mature roots); +20 (roots)
I. 'San Jose'	+21 (immature roots); +18 (mature roots)
Juniperus conferta	+12 (immature roots); −10 (mature roots)
J. horizontalis	0 (roots)
J. horizontalis 'Douglasii'	0 (roots)
J. horizontalis 'Plumosa'	+12 (immature roots); −4 (mature roots)
J. squamata 'Meyeri'	+12 (immature roots)
Kalmia latifolia	+16 (immature roots)
Koelreuteria paniculata	−17 (twigs); +16 (immature roots); −4 (mature roots)

* differences in temperatures for the same species indicates more than one reference or test or differences in experimental procedures.

chart continued on page 34

Aside from all the other stress-creating situations that challenge the survival of plants in a city or urban environment is the failure of the plants to re-grow in the spring. Even with the best care during the prior growing season and attention during the winter, the entire plant will either appear to be dead come spring or buds will swell and perhaps open a bit. Then the entire plant appears to suddenly die.

This phenomenon is common in container nurseries. The plant which classically exhibits these symptoms is the tough juniper. All through winter, it appears a healthy green until spring when warm temperatures arrive. Just when the nurseryman thinks his winter headaches are over, almost overnight all the junipers take on a sickly shade of yellow-green, ultimately turning dead-brown.

The problem is often found to be dead roots, apparently killed during some period of unanticipated low temperatures—temperatures which did not affect the plant's stem and leaves.

Where landscape architects in the past have relied on available literature that lists the lowest winter temperatures at which a plant will survive, little if any information has been available on the low temperatures at which the roots of these plants will survive.

Lower temperatures

This information is important because the roots of plants contained in above-ground containers are often subjected to much lower temperatures during winter than they would ever be exposed to in either their native or transplanted home.

History and experience would lead to future planting recommendations. And scientific techniques such as differential thermal analysis can quickly be used to determine the lowest survival temperature for almost any plant tissue. However, the added artificial environment provided by planting containers introduces variables which may have to be determined on an individual basis.

First it must be realized that any soil volume elevated above ground will both cool and heat faster than on bare ground. More importantly, it will also heat to higher temperatures and cool to lower temperatures than that same surrounding soil. The dynamics of this heating and cooling occurs daily, weekly, seasonally and annually.

Larger soil volumes heat and cool slower than smaller volumes. However beneficial the use of a large soil

Fine Fescue Defined

What are Fine Fescues and why are they so important to turf managers?

Our Fescue turfgrasses are part of most every park, golf course, industrial campus, athletic field, condominium commons and home lawn from the transition zone, Northward.

But, many people are not aware of that. Perhaps we are the most overlooked turfgrass in existence.

We feel that Fine Fescues are the best turf investment a grounds manager can make. And, we'd like to point out *why.*

Fine Fescues are *real* grass. And, as with all living things, there is give and take. Sure, our Fescues take water and some maintenance, but they are better *givers.* Our natural grass turns noxious gases into oxygen and is a natural air conditioner for turf users.

We feel that while artificial turf has its place on locker room floors, it has no business where *real* people work, play and relax. Our grass is just *naturally* more refreshing.

Our Chewings (Festuca rubra commutata) and creeping red (Festuca rubra rubra) Fescues are rather unique when compared with other turfgrass species. Although they have most of the features of other cool season grasses, Fescues have several distinct benefits worth noting.

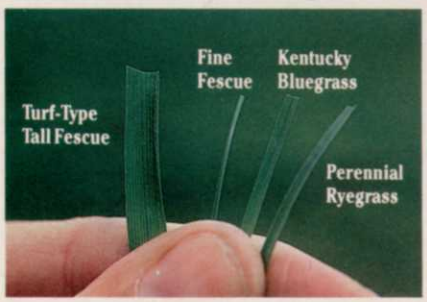
Fine Fescues are low maintenance. Our varieties require less fertilizer and water than other species. That's a big *plus* at today's water, fertilizer and manpower prices.

Fine Fescues fare well around trees. It seems our grass doesn't need as much sunlight, water and nutrients as other turfgrass species. Because Fescues don't compete with trees for these important elements, they're called *shade grass.* Our Fescues don't creep into flower beds, nor crowd out other species in a mixture.

And, because they're Oregon grown, our Fescues germinate, adapt and perform better than imported types.

You'd expect to pay a fortune for such a turfgrass, but Fescues are quite reasonable

Why don't Fescues cost a great deal? Fine Fescues have been around a long time and have been changed very little. Why mess with a good thing? While other former "pasture" species are coming closer to looking like our old standard; receiving notoriety for their "improvements" and enjoy the price increases associated with the word "new," our Fescues have continued what they do best . . . support the up-and-comers. But then, Fine Fescues were meant to be stepped on.



Fine Fescues are Ideal for Recreation, Sports and Leisure

Not only do Fine Fescues excel alone or in perennial ryegrass/Kentucky bluegrass mixtures on horizontal playing surfaces; Fescues are excellent for low maintenance areas like berms, roadside banks, ski slopes and hilly spots that don't retain moisture. So, you see, Fescues are ideal all-around grasses for *all around* your recreation and sports facility. Their low maintenance requirements offer *turf managers* a chance for a little more leisure . . . and there's nothing wrong with that.

For a series of nine tech sheets on Oregon grown Chewings and creeping red Fescues, call or write:

Oregon Fine Fescue Commission
866 Lancaster Dr. SE
Salem, OR 97301
503/585-1157

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TEMPERATURE GUIDE

AVERAGE KILLING LOW TEMPERATURES:

Species	Killing Temperatures (°F)
Leucothoe fontanesiana	+19 (immature roots); +5 (roots)
Lilium cordatum var. glehnii	+23 (buds); +23 (bulb); +23 (roots)
Lysimachia vulgaris var. davurica	+18 (buds); +18 (rhizomes); +18 (roots)
Magnolia soulangiana	+23 (roots)
M. X soulangiana	+23 (roots)
M. stellata	+23 (roots)
Mahonia bealei	+25 (immature roots); +12 (mature roots)
Maianthemum dilatatum	+14 (buds); +23 (rhizomes); +23 (roots)
Miscanthus sinensis	+18 (buds); +18 (rhizomes); +18 (roots)
Pachysandra terminalis	−4 (buds); −4 (leaves); +18 (rhizomes); +23 to +15 (roots)
Petasites japonicus var. giganteus	+23 (buds); +23 (rhizomes); +23 (roots)
Picea glauca	−10 (roots)
P. omorika	−10 (roots)
Pieris floribunda	+5 (roots)
Pieris japonica	+14 to −8 (twigs), −11; +16 (immature roots); +10 (roots)
P. japonica 'Compacta'	+15 (roots)

chart continued on page 35

volume may appear then, the volume does not heat and cool uniformly. Outside edges, and especially southern and western edges, will be affected most dramatically—possibly to the extent that roots will be killed only there from high or low temperatures while interior roots remain undamaged.

Containers with shapes that expose a greater surface area per unit volume will both cool and heat faster than containers that expose less. Containers that present a large surface area to the ground beneath also benefit from the heat transferred from that ground.

As might be expected, the color of the container can also make a dramatic difference in the temperature dynamics as well. Darker colors absorb more light and heat than do lighter-colored ones. Where light-colored containers may prove beneficial during summer months, a darker-colored one may prove as beneficial during the winter season. However, a dark container in winter may also result in container temperatures too high during the day, leaving the roots in a condition unable to quickly adjust to lower nighttime temperatures. The material from which the container is

MITE.

TEMPERATURE GUIDE

Species	Killing Temperatures (°F)
Plantago asiatica	+14 (buds); +14 (rhizomes); +14 (roots)
Potentilla fruticosa	−10 (roots)
Pyracantha coccinea	+18 (roots)
P. coccinea 'Lalandei'	+25 (immature roots); +18 (mature roots)
Pyrola alpina	+18 (buds); +9 (leaves); +23 (rhizomes)
P. incarnata	+1 (buds); +5 (leaves); +18 (rhizomes)
P. renifolia	+9 (buds); +23 (leaves); +23 (rhizomes)
P. secunda	+1 (buds); +5 (leaves); +23 (rhizomes)
Sanguisorba tenuifolia var. alba	+18 (buds); +18 (rhizomes); +23 (roots)
Sanicula chinensis	+23 (buds); +23 (rhizomes); +23 (roots)
Solidago virga-aurea	+9 (buds); +14 (rhizomes); +14 (roots)
Stephanandra incisa 'Crispa'	+18 (immature roots); 0 (mature roots)
Taxus X media 'Hicksii'	+18 (immature roots); −4 (mature roots)
T. media 'Nigra'	+10 (roots)
Tiarella polyphylla	+14 (buds); +18 (leaves); +14 (rhizomes); +23 (roots)
Trifolium pratense	+23 (buds); +23 (rhizomes); +23 (roots)
Viburnum carlesii	+15 (roots)
V. plicatum f. tomentosum	+19 (immature roots); +7 (mature roots)
Vinca minor	+15 (roots)

made can also affect soil temperatures. Just as in heat gain and loss in homes, thin dense materials transfer heat more rapidly.

Other factors

Sunshine and air temperature do not always act alone in determining the fate of the roots in containers.

The nature of the surroundings will also affect the resultant container temperature. Large expanses of nearby asphalt or concrete, as well as other large heat-absorbing masses and light-reflecting surfaces, will combine to dramatically alter the container temperature. Containers unprotected by any surrounding shelters or large material masses will cool faster and deeper than otherwise-protected containers. Containers which wick water to an outside surface can cool the interior soils to temperatures lower than air temperatures. This may be a benefit in the summer, but a few degrees lower in the winter may damage roots.

The type of soil can also affect container temperatures. The movement of heat through soil is generally affected by porosity, moisture and organic content.

continued on page 36

NEW LIQUID FORMULATION!

MIGHTIER.

In the battle for healthy ornamentals, only the strong emerge victorious. And the weak fall by the wayside.

Introducing new flowable MORESTAN® 4 Ornamental Miticide.

With MORESTAN, you get the strength you need to defeat even the worst mite infestations, the type of infestation that can devastate an entire ornamental crop. Superior performance in a water-based liquid formulation, free of solvents that can cause phytotoxicity. With proven knock-down power, strong ovicidal activity and excellent residual control.

MORESTAN. For the power to control the mightiest of mite problems.

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Generally, organic soils do not transfer heat as fast as mineral soils. Where soil volume and type, container color and material may afford overnight protection from low temperatures, none of these may provide any protection from a period of sustained low temperatures.

The freeze factor

When roots were killed by low temperatures, it is often said that the reason for their death was due to freezing. As evidenced by the depth to which frost penetrates in many parts of the country, the roots of most temperate zone plants will survive freezing temperatures quite well.

The damaging low temperature zone for the roots of many plants is generally between 15 and 25° (see chart). It must be realized, however, that the killing low temperatures listed for these plants was determined for plants that had become completely acclimated to the winter season. Not indicated is the increased susceptibility of damage to roots at even higher temperatures during other times of the year.

Roots in the normal position in the ground naturally acclimate more slowly in the fall to low temperatures than do the plant parts above-ground. Where a temperature of 25° may not injure a root in December or January, the same temperature experienced during October or November may prove fatal.

Where freak occurrences of low temperatures of short duration normally do not affect roots in the ground, soils in containers can be affected much more dramatically.

FACTORS AFFECTING HEALTH OF PLANTS IN ABOVE-GROUND CONTAINERS

1. LOW TEMPERATURES!
2. VOLUME OF SOIL
3. CONTAINER SHAPE
4. CONTAINER COLOR
5. CONTAINER MATERIAL
6. NATURE OF SURROUNDINGS
7. TYPE OF SOIL

Jim Borland owns Flora West in Denver. He is a horticultural consultant specializing in native and dryland plants and former plant propagator for the Denver Botanic Gardens.

Additional variables

Some of the same variables involved with potential low temperature damage to roots in containers is applicable to plantings at the top of walls. At least one side of the root system is exposed to the weather at all times. Until roots can establish themselves some distance from the wall, they are susceptible to the same problems.

There is no easy way to determine what is the best size, shape or color of container to use for any particular project since too many other variables are involved. The best piece of advice aside from not using containers is to use the largest container possible. The closer we can approximate the natural condition, the better will be the plants in the container. **LM**

Why play host to unwanted guests, when Lebanon has what it takes to keep pests off your turf?

Your lush green turf is plenty of good eating to all kinds of insects. Like grubs. Chinch bugs. Sod webworms. And billbugs.

That's why Lebanon features an outstanding choice of formulations with DURSBAN, straight or in fertilizer/chemical combinations. DURSBAN controls almost any kind of surface or soil-feeding insect, and keeps controlling weeks after you apply. It's also effective as a perimeter treatment around buildings and patios, to stop nuisance pests like ants, ticks, earwigs and fleas.

Feed and control in one easy move.

Save time and money with Lebanon combination fertilizers and DURSBAN. If you want the long-range benefits of a premium homogeneous fertilizer, use Country Club 19-4-6 With DURSBAN. Or if you prefer the controlled-feeding of an S.C.U. blend, choose Lebanon Pro 20-3-5 With DURSBAN.

For situations that require a straight chemical application, Lebanon offers a 2.32% DURSBAN formulation on a granular cob base.

For more information, contact your local Lebanon distributor or call our Greenline, today, at **1-800-233-0628.**

Send pests the message—the picnic is over with DURSBAN.

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TOTAL TURF CARE
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Don't forget the DURSBAN* or pests will have a picnic.

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Get ready to profit from fall lawn renovation with the LESCO Renovator 20. It's the easy-to-operate slicer/seeder with built-in maneuverability and proven performance.

Powered by an 8-HP Honda engine, the LESCO Renovator 20 features exclusive hydraulic drive with 0 to 2 mph forward speed control. Spring-loaded reverse gives the unit greater maneuverability in tight areas and simplifies trailer loading and unloading. A compact low-profile design provides excellent hillside stability.

Last year, the renovator supply did not meet demand. It could happen again. Prepare now to profit this fall. Order the proven profit-maker today.

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Reroute roots and
the ugly side of yo

Introducing Typar® Biobarrier™ root control system.

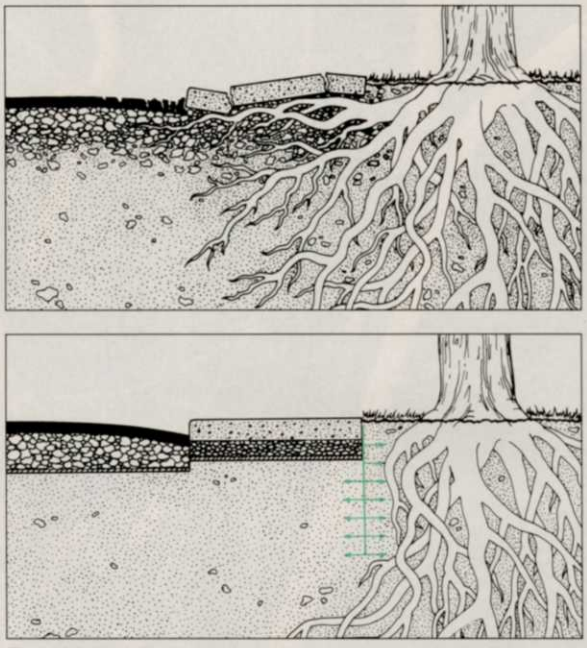
Give unsightly roots a new direction in life. Down. With new Biobarrier, the advanced root control system that sends your maintenance costs in the same direction.

Biobarrier combines two of the most effective, longest-lasting elements in root control. One is Treflan®, one of the most proven herbicides in the country, featuring new controlled-release pellet technology. The other is Typar® fabric, made with rugged polypropylene geotextile that's porous enough to let air and water through but holds the Treflan pellets in place.

Together, they reroute roots without harming your trees and plants. And preserve the beauty of your landscaped areas — golf greens, cart paths, sidewalks, curbs, walkways, parking lots, swimming pools, gardens and others — for years to come.

Forget roots for 15 years.

Underground, Biobarrier sets up a solid rootproof zone that spans one to two inches on each side of the fabric. That's the Treflan controlled-release vapor zone. A zone so powerful, it repels roots at a controlled rate for 15 years or more.



Top Without Biobarrier, tree roots penetrate paved surface and aggregate base, causing unsightly cracking and heaving.

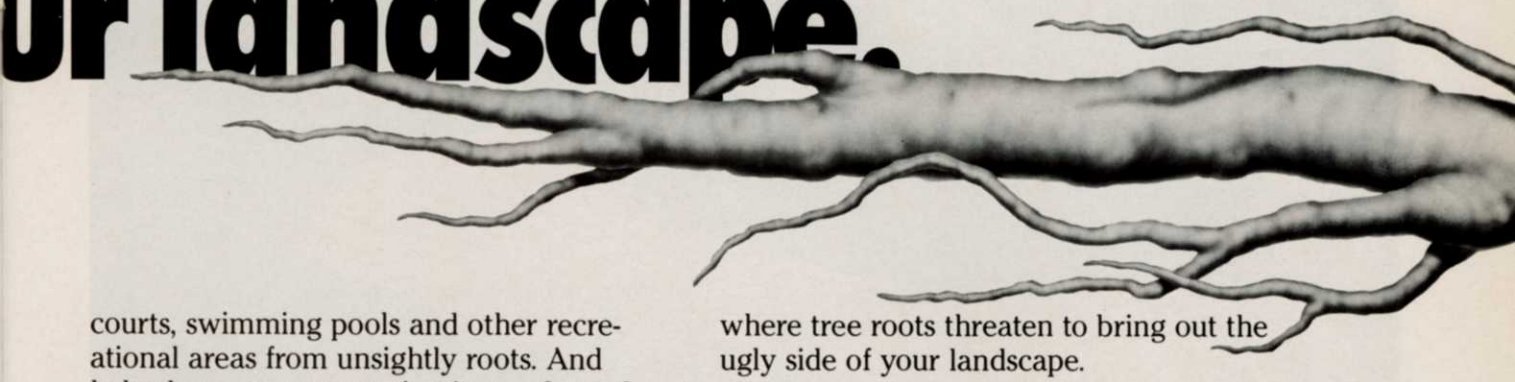
Bottom With Biobarrier, a protective zone of Treflan vapor reroutes roots downward without harming roots or tree.

Forget extra labor.

Without Biobarrier, you're spending plenty of time and labor to trench, trim roots and replace damaged landscaping. But with Biobarrier, you'll only do the job once every 15 years—trim roots, replace damaged cart paths and install Biobarrier.

By rerouting roots downward, Biobarrier protects your golf greens, cart paths, tennis

tame
ur landscape.



courts, swimming pools and other recreational areas from unsightly roots. And helps keep your reputation in good standing among your customers.

Easy on plants and landscaping.

Unlike other control methods, Biobarrier won't harm trees or nearby landscaping. It doesn't kill roots, it just reroutes them away from your golf, recreational or landscaped areas.

Treflan's active ingredient is biodegradable. It cannot be taken up by plant systems. And it stays put without leaching out to keep rerouting roots for 15 years or longer.

Easy to install.

The Typar fabric in Biobarrier is flexible to make installation simple. Just install vertically along your golf, recreational or landscaped areas where tree roots threaten to bring out the ugly side of your landscape.

Call toll-free.

For the complete story on Biobarrier, see your Elanco representative. Or send for a free technical brochure from Elanco Products Company, Lilly Corporate Center, Dept. EM-455, Indianapolis, IN 46285, U.S.A. Or call toll-free: **1-800-352-6776.**

TYPAR® Biobarrier™
Root Control System

Typar Biobarrier is jointly marketed by Reemay, Inc., a member of The InterTech Group, Inc., and Elanco Products Company, a division of Eli Lilly and Company.

Treflan® — (trifluralin, Elanco)

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ELANCO

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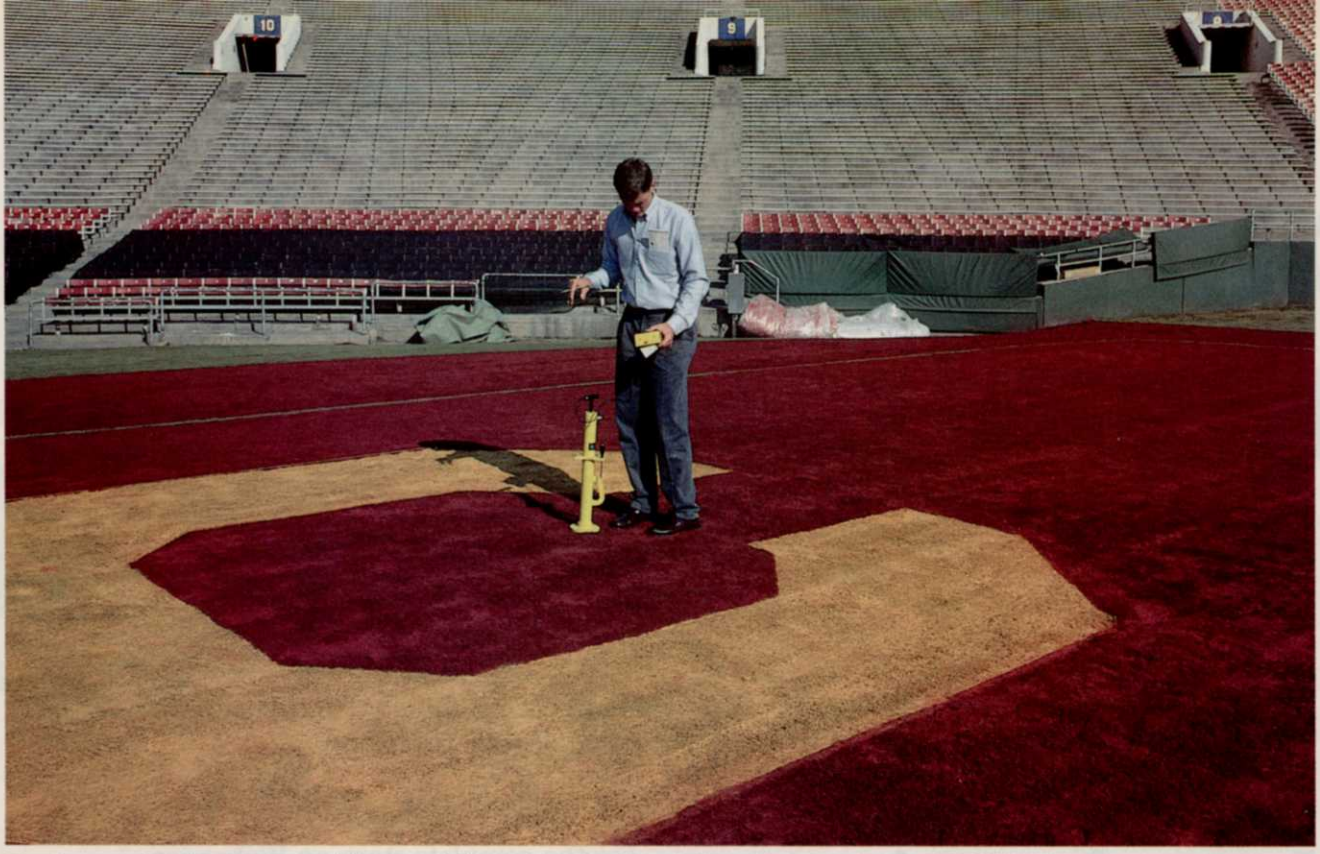

The interaction between an athlete and the playing surface is based on traction and field hardness. Measuring these characteristics, researchers are paving the way for improved field conditions across the country.

SAFE AT ANY SPEED

The primary objective of experiments conducted at Penn State University was to advise high school athletic field managers of ways to improve playing field conditions. The conclusions were not surprising.

by John N. Rogers III, Ph.D. and D.V. Waddington, Ph.D.

An athletic field's quality is assessed differently by players, coaches and fans. Viewers judge it by appearance. However, a dark green field with 100 percent turf cover doesn't guarantee player performance or safety. For players and coaches, quality is a function of performance and safety.

Interactions between player and surface are based on traction and field hardness. To measure these characteristics, researchers use equipment designed to evaluate turf surfaces.

● *Traction*, the relationship between a player's foot and the playing surface, can be quantitatively assessed with a device known as a shear vane, which simulates the action of cleats pressed into the ground. The measurement is made by rotating the shear vane until the turf or ground breaks loose. Similar devices pressed onto but not into the surface have also been used.

● *Hardness* is a measure of the surface shock-absorbing properties. It can be determined using accelerometers attached to weighted objects that simulate a player's falling or running on the surface. By dropping the objects from a constant height and using a constant mass, different surface hardnesses can be compared.

Study results

Good maintenance practices and good field conditions were generally associated with lower impact values, which indicates more softness. Higher impact values were found for fields with lower moisture contents, greater bulk densities and less turf cover. It became apparent that, in football field maintenance and renovation programs, the center of a field requires the most attention.

And in general, higher shear resistance values were found for game fields and outside hashmarks, where greater vegetation had a more apparent effect than bulk density and moisture values, which would have favored low shear resistance.

The volunteers

Twelve volunteer Pennsylvania high schools with 24 athletic fields were evaluated five times each between November 1986 and November 1987. Evaluations were done to include as many different environmental conditions as possible, both inside and outside the hashmarks at the 35-yard lines.

School representatives provided

No mites. No damage.

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information regarding fertilization, cutting height, weed control, aeration, liming and irrigation. The information included both past and present management practices.

Average hardness data for position and field type for all recording periods are shown in Table 1. With a heavier object, there was a significant difference in hardness between areas inside and outside the hashmarks. Impact values were higher inside the hashmarks throughout the study. These higher values were associated with less turf cover, drier soil and/or more compact soil. The least amount of differences were in March measurements. This was attributed to the greater amount of frost heaving on the inside areas, which were bare or less densely covered with turf than the outside areas. The soil was loosened, causing lower impact values. As the year progressed, the differences increased.

With the heavier object, impact values for game fields were lower than for practice fields. The greatest differences were in November, following football season. Greater differences between field types as the year progressed were attributed to more intensive practice field use.

Impact values for the lighter hammer followed the same patterns.

In general, the lowest values reflected a combination of dense turf, low soil bulk density and high soil moisture.

And artificial turf?

As observed in Table 2, values obtained at various times on a new artificial turf field fell within the range of the natural high school fields. A practice field that had frozen was much harder than either artificial or natural unfrozen turf. Values for floor surfaces in a home were higher than values for the high school fields. It should be noted that variation would also be expected for different artificial turf surfaces or floor surfaces in homes.

Values for shear resistance (traction) are shown in Table 3. On each measurement date, these values were lower—although not always significantly lower—for practice fields and positions inside the hashmarks (except for November, 1987).

Turf or soil giving way under foot would be associated with lower shear values. Certain impacts between players might make it better for the soil or turf surface yield than a player's joints. From the standpoint of efficiency of play, the variation in footing, as indicated by a range of shear values for the same field, could affect performance as players move from one area of the field to another.

Maintenance levels

It is unfortunate that practice fields, used more than game fields, received less maintenance. Such findings indicate that in turfgrass management decisions, game field appearance may receive more attention than playing quality of both practice and game fields. Fortuately, much of the maintenance work aimed at appearance also improves the playing surface. However, a need to educate field managers on the role of turfgrass management in providing a good playing

Field hardness was most significant between hashmarks, a result of less turf cover, drier soil and/or more compact soil.

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TABLE 1.

Hardness values for field type and position, November 1986-November 1987.

Field type and position	Hardness: 2.25 kg hammer				
	Nov 86	Mar 87	Jun 87	Aug 87	Nov 87
	gmax				
Game	65**	57	79	76	76**
Practice	80	59	90	94	94
Inside	85**	60**	90**	92**	98**
Outside	60	56	78	77	72
	Hardness: 0.5 kg hammer				
	Nov 86	Mar 87	Jun 87	Aug 87	Nov 87
	gmax				
Game	102**	78	105	96*	120**
Practice	123	82	127	125	157
Inside	137**	85**	132**	120*	166**
Outside	89	76	99	101	110

* Significantly different at the 5% level.
** Significantly different at the 1% level.
gmax = maximum deceleration.

Source: The authors

TABLE 2.

Impact values for high school fields vs. impact values for other surfaces.

Surface	Hammer	
	0.5 kg	2.2 kg
	gmax	
High school fields	50-286	33-167
Artificial turf	109-172	60-91
Frozen practice field	404	303
Tiled, concrete basement floor	1,440	1,280
Carpet and pad on tiled concrete floor	260	190
Carpet and pad on hardwood floor	86	134

gmax = maximum deceleration.

Source: The authors

TABLE 3.

Traction (shear resistance) values for field type and position, November 1986-November 1987.

Field type and position	Traction (shear resistance)				
	Nov 86	Mar 87	Jun 87	Aug 87	Nov 87
	kPa				
Game	69	68	80*	62	82
Practice	68	62	68	58	78
Inside	67	57**	68**	55**	82
Outside	70	73	80	64	78

* Significantly different at the 5% level.
** Significantly different at the 1% level.
kPa = kilopascals (1 kPa = 0.145 lb in2)

Source: The authors

surface still exists.

Game fields were in better condition than practice fields. They had lower bulk densities, fewer weeds and more turf cover. Differences indicated that areas inside the hashmarks had more wear.

None of the fields in the study had modified soil. Native soils were all medium- to fine-textured loam, silt loam, silty clay loam and clay loam.

Variables

Variables were calculated in five categories: overall, game, practice, inside hashmarks and outside hashmarks. In general, an overall correlation existed between maintenance practices and vegetative variables. Fields receiving the best maintenance had the lowest weed cover and highest total turf cover. The correlation of N fertilization and aeration indicated that when one of these important maintenance inputs was intensified, so was the other.

A positive correlation was found between soil moisture and aeration levels. (Increased moisture probably reflects greater infiltation and less runoff on aerified fields.) There was slight correlation between field hardness and maintenance practices (As aeration and fertilization levels increased, field hardness decreased.)

Field hardness seemed to be affected most by percentage of soil moisture. In general, soil moisture correlated better with hardness as measured by the lighter hammer. In addition, an increase in bulk density was asociated with an increase in a field's impact value. Correlations between hardness and bulk density were not as great as those between hadness and percentage of soil moisture.

In general, then, when soil nutrient levels, N fertilization, core cultivation and weed and turf cover varied to indicate better maintenance practices, that variation accompanied a decrease in hardness.

For the most part, shear resistance values were not significantly correlated with maintenance practices, but for positions inside the hashmarks there was some indication that shear values decreased as weed cover increased. Weed populations were observed to be higher on worn areas where the turfgrass root system would be insufficient to create a high shear resistance. Field hardness and shear resistance relationships were both variable and slight.

Correlation between dates of the measured characteristics (hardness, traction, moisture, bulk density and weed cover) was variable. **LM**

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Searching for better ways to handle underground construction?

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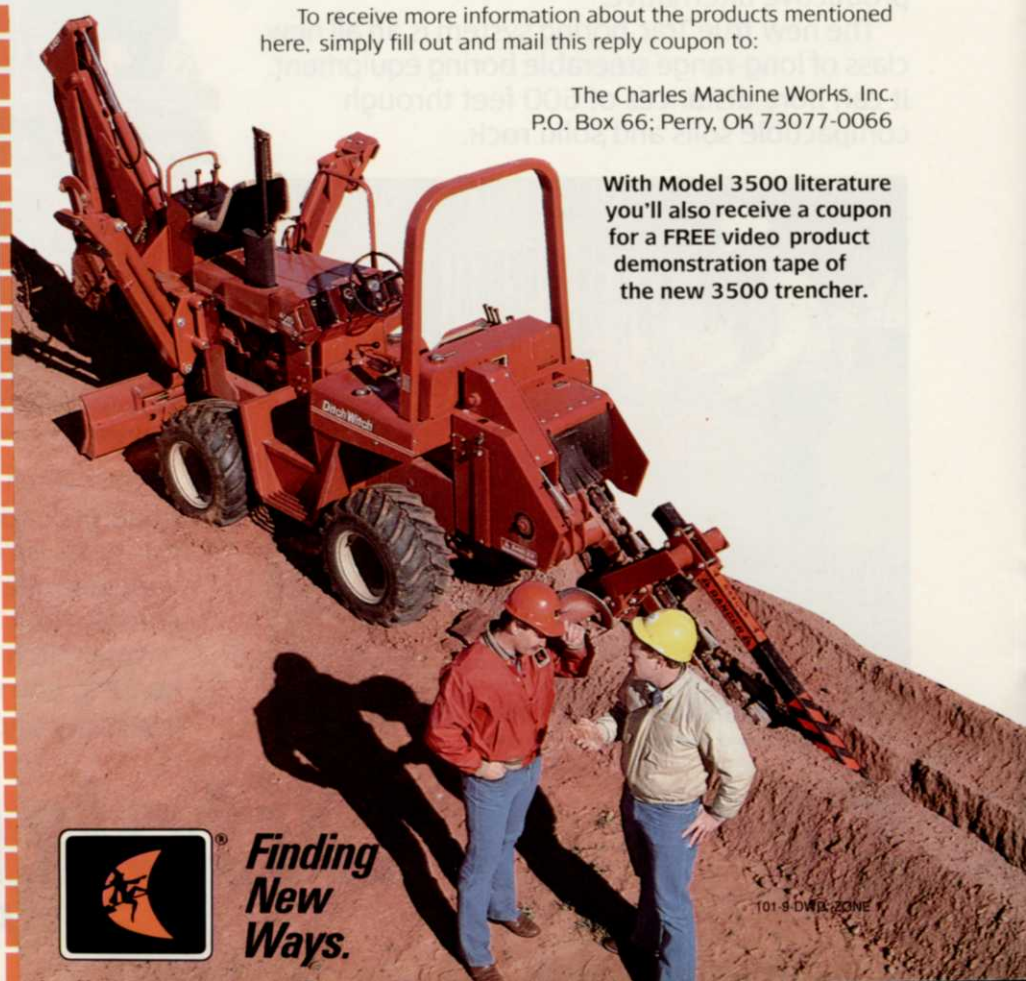


Finding New Ways.

101-9 DWTR-ZONE

THE DEMAND FOR DIESEL

by Dennis Bourgoin and Tom Kane

The need for exceptional durability and long-term reliability without costly downtime is not new for the landscape industry. However, the trend toward compact, lightweight, high-speed diesel engines to handle landscape equipment applications, is.

Initially, there was reluctance to accept diesel power for smaller turf equipment. The primary engine used for landscape mowers was the air-cooled gasoline engine because it was lightweight and compact and offered a high horsepower-to-weight ratio. Without a cooling system to maintain, it was the exclusive choice to power turf equipment until the emergence of the small, lightweight, liquid-cooled diesel engine.

The major difference between gasoline and diesel engines is the method used to ignite the fuel/air mixture.

- A diesel engine introduces air only into the cylinder for compression, then injects a precisely-controlled amount of fuel into this red-hot compressed air. The burning of this expanding mixture acts on the pistons, turning the crankshaft, thereby producing horsepower and torque.
- In a gasoline engine, the air and fuel are mixed in the carburetor. At the proper time this mixture is ignited by the ignition system and spark plugs. From this point on, the power and torque are derived in the same way as a diesel.

Although both engines appear to be similar in the way they produce power, there are some subtle but important differences. Diesel engines compared to air-cooled gasoline engines offer several advantages:

Diesel fuel helps lubricate some of the engine parts further, adding to engine life.

Heavy-duty components. Diesel components are designed and built stronger to withstand the strenuous demands of the engine's higher compression ratios and inherent higher cylinder pressures. Longer engine life and durability are the benefits.

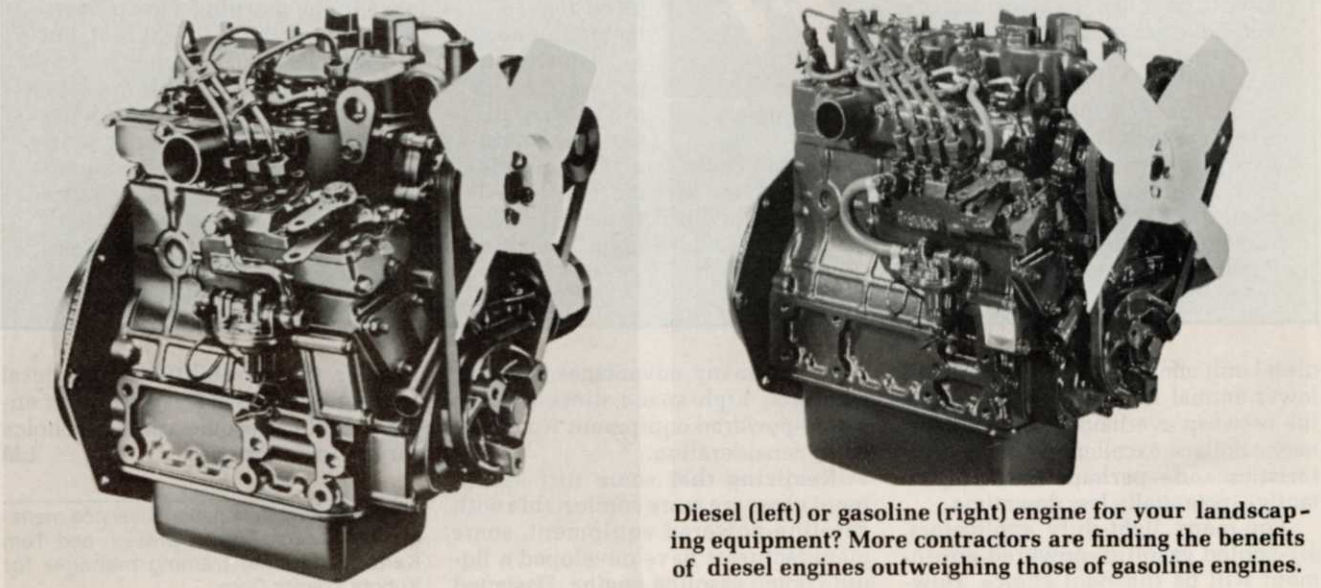
Lower fuel consumption. Engine heat is used more efficiently by diesels, resulting in less fuel consumption and longer mowing time between fills. Typically, diesels are 30 to 35 percent heat-efficient whereas air-cooled gasoline engines are approximately 25 to 28 percent heat-efficient. This savings is realized not only in annual fuel costs but also saves labor dollars spent on frequent refueling and downtime.

Less maintenance. With no ignition system on a diesel to tune, this potential failure point is eliminated. The carburetor, another potential failure point, is totally eliminated on a diesel. No adjustments are normally needed on a diesel if due care is given to the fuel filter, oil changes and air cleaner system. A diesel will outlast gasoline units if good service maintenance procedures are practiced.

Torque characteristics. The torque curve on a diesel engine is generally flatter than a gasoline engine torque curve. This means that the torque does not drop off excessively at lower or higher rpms. The benefit to the landscaper is powerful cutting even in wet conditions.

Fuel. Diesel fuel (#2D) does not readily ignite. It is safer to handle and can be stored over long periods of time, even over a season. Diesel fuel also helps lubricate some of the engine parts further, adding to the life.

Although the initial purchase cost is higher for diesel-powered equipment than air-colled gasoline units, the up-front investment is often returned. The



Diesel (left) or gasoline (right) engine for your landscaping equipment? More contractors are finding the benefits of diesel engines outweighing those of gasoline engines.

Circle No. 109 on Reader Inquiry Card

What the industry is saying: To diesel or not to diesel?

It is no longer myth but fact: diesel power is catching on in the lawn and landscape industry.

"Kubota is the overall dominating diesel engine," says Mark Martin of DeBra Turf Equipment, Ft. Lauderdale, Fla. "Kawasaki is big in walk-behind rotaries, but Briggs & Stratton is just in the small stuff now."

When buying equipment, various factors must be considered by the prospective buyer, beginning with initial cost. Gasoline engines, of course, are less expensive out the door than diesel. Other considerations:

- horsepower;
- torque;
- physical size of the engine;
- noise level;
- serviceability;
- dependability;
- parts availability;
- cost of replacement parts; and
- use level (how many hours per week?).

Here is what some industry people are saying about diesel and gasoline engines:

Bill Lee, director of marketing for commercial equipment, Deere & Co.: "We believe that small operators may want to look at liquid-cooled gasoline engines. They are more durable now than when they first came out. In the mowing contractor market where you're not doing that heavy drafting or heavy loading, the mower will wear out its moving parts before either diesels or liquid-cooled gasoline engines. And you don't necessarily have to have 'gas hogs' just because you have gas engines.

"What it comes down to is that, if a guy's fleet is all gas and the business is doing well, he probably won't make the change. If the organization has already begun to make the transition to diesel, it will continue to drive toward diesel."

Michael Currin, Greenscape, Fayetteville, N.C.: "We are representative of a lot of landscape contractors. Many of our vehicles are bought second-hand and that affects whether we buy gas or diesel. We very rarely buy new vehicles or tractors. We just can't justify it. So usually, we don't have a choice.

'Diesel is the way everybody would like to go, though not everybody has the money. They like their longevity and lower maintenance costs.'

Mike Currin
Greenscape
Fayetteville, N.C.

"The big problem we found with diesels is their air filters. If people don't pay attention to that, they're in trouble."

Ron Kujawa, KEI Enterprises, Cudahy, Wisc.: "We're switching to diesel in all our vehicles one ton and above. On our large out-front mowers, we believe the Kubota 340 engine (28½ hp) is outstanding. It puts out so much torque that it's comparable to a larger engine.

Ron Kujawa

"Diesel engines have more torque and less maintenance. There is a higher initial cost, but we feel it's worth it. If there's a drawback to diesel power, it's that you have fewer places to get the fuel.

"But the first-time buyer of used equipment will be relegated to what's available, and that will most likely be gas power."

"Diesel is the way everybody would like to go," adds Martin. Not everybody has the money, but it's at least in the back of their minds. People are leaning toward diesels because of their longevity, lower maintenance costs and fuel economy.

"We're seeing landscapers going to diesel engines on riding rotaries in the 72-inch class. They feel that, in the long run, diesels can take the abuse. And if it lasts that much longer, it makes them more competitive."

Don Oliver, Dally Landscaping, Lodi, Calif.: "I have one Toro mower that's diesel. The other three riders are gasoline-powered. We've had wrong fuel problems twice already. Guys pick up the wrong surplus gas can when they leave in the morning. I keep warning them to take the right fuel, but they still get it mixed up."

Despite little problems like those at Dally, diesel engine sales are on the rise. It's no wonder. Martin reports mechanical problems with just three engines since DeBra has been selling diesel—and that's less than 1 percent of the total engines sold. □

diesel unit offers cost savings through a lower annual fuel cost, longer engine life between overhauls, fewer maintenance dollars, excellent power characteristics and—perhaps most importantly—potentially less downtime.

For many light-duty applicators, air-cooled gasoline-powered equipment will be the right choice. However, the many advantages of quiet, compact, high-speed diesels make diesel-powered equipment worthy of close consideration.

Realizing that some turf equipment users are more comfortable with gasoline-powered equipment, some manufacturers have developed a liquid-cooled gasoline engine. Designed to offer the durability of the diesel with the familiarity of a gasoline engine, this has become a popular choice for the turf industry. **LM**

Dennis Bourgoin is national service manager for Kubota Engine Division and Tom Kane is national training manager for Kubota Tractor Corp.

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Figure 1. Experimental golf green at the University of Minnesota Golf Course following topdressing. Sections of different soils are evident from color of topdressing material.

Figure 2. Experimental golf green in August 1986, when bentgrass on all soil mixtures was in excellent condition.

Figure 3. Damaged turf growing in soil mixture No. 5 (right half of photo) compared to the relatively undamaged turf growing in soil mixture No.3 in April 1987.

ADVENTURES IN WATER STRESS

Drought conditions and failure of the irrigation system produce interesting findings on an experimental green in the Midwest.

by Don Taylor, Ph.D., University of Wisconsin, River Falls

The drought of 1988 will likely be remembered for a long time by turfgrass managers and golf course superintendents across the United States. Unirrigated turfgrass through the north central region suffered damage as a result of the drought. Even irrigated turfgrass areas sometimes had difficulty keeping up with the water demand.

Hot, dry conditions during spring, 1987 and summer, 1988 plus irrigation problems gave some interesting results on water stress damage at an experimental green on the University of Minnesota Golf Course.

Here's what happened.

In the early 1980s, golf course superintendents in Minnesota were having difficulties establishing and maintaining a dense creeping bentgrass stand on golf greens constructed with high sand-content soil. The Minnesota Golf Course Superintendents Association investigated but failed to identify the underlying problem. So members decided to construct an experimental green to determine the long-term growth of creeping bengrass on five soil mixtures.

The green was constructed according to U.S.G.A. guidelines, save one. It was divided into five sections, and five different soil mixtures were used in the rootzone layer (Figure 1). The five soil mixtures used on the green are described in Table 1.

The green was constructed in the summer, 1984 and seeded with Penncross creeping bentgrass in September.

Originally, it was thought that nutritional differences or development of excessively compacted soil conditions might lead to differences in establishment and growth of creeping bentgrass. But after four years of bentgrass growth, nutritional differences have remained minimal on each of the soil mixtures.

Soil compaction problems (as measured by root growth and water infiltration rates) appear to be nonexistent on any of the soil mixtures. However, the unusual weather condi-

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Turf Quality

NATIONAL TURFGRASS EVALUATION PROGRAM
COLUMBIA, MO 1988-89

VARIETY	AVG. SCORE
Finelawn 1	6.1
Apache	5.5
Rebel	5.5
Bonanza	5.3
Mustang	4.9
Jaguar	4.6

Rated 1-9; 9 = Best

Spring Greenup

NATIONAL TURFGRASS EVALUATION PROGRAM
1984-87

VARIETY	AVG. SCORE
Finelawn 1	5.7
Bonanza	5.6
Apache	5.6
Rebel	5.5
Arid	5.5
Jaguar	5.1

Rated 1-9; 9 = Best

Fall Density

NATIONAL TURFGRASS EVALUATION PROGRAM
1984-87

VARIETY	AVG. SCORE
Finelawn 1	7.1
Mustang	7.0
Rebel	7.0
Olympic	6.8
Falcon	6.7

Rated 1-9; 9 = Best

Shade Performance

NATIONAL TURFGRASS EVALUATION PROGRAM
1984-87

VARIETY	AVG. SCORE
Finelawn 1	5.4
Apache	5.3
Jaguar	5.0
Mustang	5.0
Bonanza	4.8
Rebel	4.8
Falcon	4.6

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TABLE 1.
Soil mixtures used in the experimental green.

Soil Mix #	Description
1	3-1-1 by volume sand-soil-peat. sand - fine mortar sand. soil - silt loam (21% sand, 66% silt, and 13% clay). peat - Northern reed-sedge peat. The resulting mixture by weight was 80% sand, 17% silt and 3% clay.
2	5-1-1 by volume sand-soil-peat. sand - uniform, medium silica sand. soil - sandy loam (58% sand, 26% silt, and 16% clay). peat - Northern reed-sedge peat. The resulting mixture by weight was 94% sand, 4% silt and 2% clay.
3	85-15 by volume sand-peat. sand - fine mortar sand. peat - Northern reed-sedge peat. The resulting mixture by weight was 97% sand, 2% silt and 1% clay.
4	85-15 by volume sand-peat. sand - uniform, medium silica sand. peat - Northern reed-sedge peat. The resulting mixture by weight was 98% sand, 2% silt and 0% clay.
5	100% sand with peat tilled into the surface 4 inches. sand - fine mortar sand. peat - sphagnum peat. The resulting mixture in the surface 4 inches, by weight, was 99% sand, 1% silt and 0% clay.

TABLE 2
Water holding capacity of the soil mixtures used on the golf green.

Soil Mixture	Available water holding capacity (-30 mbar to -15 bar)	Inches of water available in 12 inch root zone
	g water/g soil	inches
1	0.20	3.4
2	0.13	2.2
3	0.11	1.8
4	0.10	1.7
5 (surface 4 inches)	0.09	1.3
5 (below 4 inches)	0.07	

tions of the past two years have led to visible differences in response to water stress among the soil mixtures.

Golf greens are often constructed—as this experimental green was—with 12 inches of rootzone soil mixture underlaid by two inches of coarse sand, which in turn is underlaid by four inches of gravel with drain tile installed.

The coarse sand and gravel layers increase the amount of water retained in the rootzone soil mixture. This is usually desirable since most soil mixtures used are very high in sand content and have low water-holding capacities.

Water available to the plants in a layered golf green is higher than what would be available in a deep soil profile with no layers. To estimate the amount of water available to plants in this green, water held between tensions of 30 millibars (equivalent to drainage at the surface of 12 inches of mix over a saturated layer) and 15 bars (the point usually considered so dry that plants can no longer extract the water) was measured. Assuming a bulk density of 1.4 g/cm.^{3} in all mixtures, the inches of water available to plants in the soil mixtures are shown in Table 2.

Water infiltration rates were measured on the green in 1986 and 1988. Rates varied dramatically between soil mixtures with soil mixture No. 5 having the highest infiltration rate (30.1 inches/hr. in 1986 and 25.3 inches/hr. in 1988) and soil mixture No. 1 having the lowest infiltration rate (2.8 inches/hr. in 1986 and 1.3 inches/hr. in 1988).

During 1986, the first year turfgrass growth was carefully monitored, bentgrass growth on all five soil mixtures was superb with no differences between plots. Figure 2 shows the golf green as it appeared in August, 1986.

In April, 1987, indications of possible problems occurred when the weather turned warm and dry very early. After a winter of almost no snow cover, March was very warm with an average temperature of 38.7°F, 9.5° above normal. Bentgrass throughout the experimental golf green turned a beautiful dark green in March, providing a stark contrast to the dormant, or dead, annual bluegrass on the fairways and approaches.

March and April were not only warmer than usual but also drier. Rainfall measured in Minneapolis was 0.3 inches in March and 0.2 inches in April, about 1 and 2 inches, respectively, below normal for those months.

In mid-April, before the irrigation system had been turned on for the season, bentgrass growing on soil mixture No. 5 started going into water stress. Despite running hoses from the clubhouse to water the green while the irrigation system was being checked, turf loss occurred on soil mixture No. 5. Figure 3, taken on April 22, shows the damaged turf on soil mixture No. 5 (right half of photo) along with the undamaged turf on soil mixture No. 3 (left half of photo). The lines dividing soil mixture No. 5 and the two bordering plots were distinct and obvious with the damaged plants restricted to soil mixture No. 5. Once

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the irrigation system was fully operational, the turf on soil mixture No. 5 gradually recovered until there were no more differences observed between plots for the rest of the season.

In 1988, bentgrass throughout the green looked excellent during April and May. The weather in May was already hot and dry, but irrigation was keeping up with water demand. During the last week in May, one of the sprinkler heads was damaged during some very hot and windy weather. Within a 48-hour period, damage occurred to turf on soil mixture No. 5, again with distinct lines showing greater damage to turf on soil mixture No. 5 than to turf on the bordering plots.

Beginning about the first week in July, the irrigation pump at the golf course began to go bad. Pressure in the irrigation lines gradually decreased for the rest of July, making irrigation of the entire course a tremendous problem. On the experimental green, water distribution problems were evident as portions began getting inadequate amounts of water. Although significant damage occurred to bentgrass growing on soil mixture Nos. 3, 4 and 5, damage was most severe on No. 5, with the edges of that plot distinctly visible. The pump was replaced in early August, 1988, but damage to turf on the green was still evident at the end of the growing season. By mid-May, 1989, bentgrass damaged the previous summer was recovering, but damaged areas were still clearly visible.

Drawing conclusions

The results on this green over the past two summers have reinforced a caution when using high sand, particularly straight sand, for the rootzone of a golf green. Adequate irrigation is absolutely critical; even irrigation problems of short duration can cause significant damage to the green. In the case of this experimental green, when irrigation problems occurred in both 1987 and 1988, sand/soil/peat mixtures or sand/peat mixtures with peat mixed uniformly throughout the rootzone layer maintained bentgrass much better than straight sand with peat tilled into the surface four inches. **LM**

Don Taylor received his master's and Ph.D. degrees in soil science from the University of Minnesota. Now an associate professor at the University of Wisconsin, River Falls, he has also served as an extension specialist in turf science at the University of Minnesota. He is currently on a one-year sabbatical leave at the Department of Agronomy and Horticulture, Brigham Young University, Provo, Utah.

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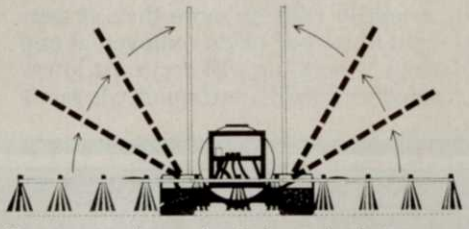

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PART II OF II

MANAGING TALL FESCUE IN URBAN LANDSCAPES

Cultural practices for this grass should be followed with an eye on its limitations and weaknesses.

by Bob Morris and John Van Dam

As turf-type varieties develop, tall fescue lawns are gaining in popularity throughout the United States. Compared to other cool-season turfgrass species, they are better suited for dry, urban climates where good quality irrigation water is available at reasonable prices.

In contrast to other cool-season grass, tall fescue can be maintained at lower fertilizer levels. It also experiences fewer insect and disease problems. However, maintenance practices for tall fescue lawns differ from those developed for bluegrass or ryegrass.

In colder climates, nitrogen applications just before the cold months extend turf color into the winter. Early spring fertilizer applications (late Jan. to Feb.) aids spring green up and turf recovery.

Tall fescue is realtively easy to maintain. However, it does have limitations and weaknesses. Typically these include:

- Poor competitiveness with more aggressive grasses;
- Disease problems;
- Lower tolerance to high temperatures than warm-season grasses such as bermudagrass and zoysiagrass;
- Poor recuperative potential and recovery following damage; and
- Moderate tolerance to compaction.

Tall fescue looks and performs best when mowed and edged between 1½ and 2½ inches. Mowing should occur regularly with no more than 40 percent of its leaf blade removed at one time or scalping will occur. At lower mowing heights, turf quality is sacrificed; weed and other grass establishment is encouraged. The heavier vascular tissue can dull mower blades.

Edging at heights lower than this encourages invasion by weeds such as crabgrass and spurge, reduces turf quality and slows recovery. If left unmowed or untrimmed, tall fescue can reach heights of 18 to 24 inches with seedheads attaining a height of four feet.

Generally, 2 to 3 lbs. of nitrogen per 1,000 sq. ft. annually is adequate under normal use. This amount of nitrogen should be split into a minimum of three applications per season and should not total more than ¾ to one pound of nitrogen per 1,000 sq. ft. per application. Higher levels of nitrogen and more frequent applications are needed with increased traffic and wear.

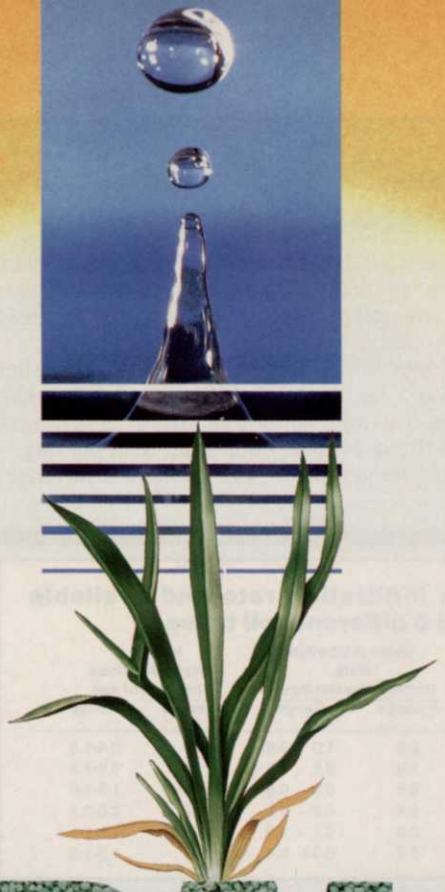
Other nutrients should be applied according to soil test reports or, when not available, use a 3-1-2 or 4-1-2 ratio fertilizer (such as 21-7-14 or 18-6-12).

TABLE 1

CALENDAR OF TALL FESCUE MAINTENANCE PRACTICES

Maintenance Practice	Spring	Summer	Fall
Mowing and Edging	———	———	
Fertilizing[1]			
Low Use	—	—	—
High Use[2]	—	— — —	—
Aerification[3]	—		—
Dethatching[3]			—
Overseeding[3]	—		—

[1] *Fertilizations during summer months should be applied using slow-release nitrogen fertilizers or low rates of quick-release fertilizers.*
[2] *Fertilizer application rate is determined by dividing the total amount of fertilizer applied during the year by the number of applications.*
[3] *Optimum time of year.*



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Familiarity with soil needed in order to irrigate properly

It's not possible to recommend a standard irrigation cycle suitable for everyone. It depends on many variables such as local climatic conditions, soil water holding capacity and its infiltration rate, soil preparation before planting, design of the irrigation system and other factors.

Changes in temperature, humidity, wind, and the intensity of sunlight interact to affect the demand for water by plants. During the summer, when temperatures are high, humidity is low and winds are strong, a turfgrass's potential for water use may exceed three- or four-10ths of an inch per day.

To reflect this change in water use, irrigation clocks should be reset several times during the year. This reduces water waste, saves money and improves general plant health.

TABLE 2

Water percolation depth infiltration rate and available water for turfgrowing and 6 different soil types

Soil Type	Percolation Depth of One Inch of Applied Water (Inches)	Water Infiltration Rate (Inches of water/hour)		Inches of Water Available per foot of soil	
		Average	Range	Average	Range
Sand	12-18	2.0	1.0 -10.0	0.8	0.4-1.0
Sandy Loam	8-15	1.0	0.5 - 3.0	1.1	0.9-1.3
Loam	6-10	0.5	0.3 - 0.8	1.5	1.3-2.0
Silt Loam	6- 8	0.4	0.2 - 0.9	2.0	2.0-2.1
Clay Loam	5- 6	0.3	0.1 - 1.0	1.9	1.8-2.1
Clay	3- 6	0.2	0.02- 0.4	1.9	1.8-1.9

Source: the authors

Irrigating with overhead sprinklers during windy weather is uneconomical and inefficient. Irrigations should be made when winds are light or not blowing. Early morning hours usually provide the best timing for overhead irrigations.

Remember that plants use water, soils don't. Turgrass growing on sandy soils and clay soils use the same amount of water. However, turfgrass growing on sandy and clay soils requires irrigations more frequently because the soil reservoir of water held by these soils is small compared to the amount of water held by clay soils.

The duration of irrigation should depend on the type of soil or soil texture (percentage of sand, silt or clay) and how the soil was prepared prior to planting. Ideally the duration of irrigation should be long enough for the water to percolate into the grass's rootzone (12 to 24 inches and deeper for sandy soils). On sandy soils this would require about 1 inch of water to reach 15 inches. On the heavier clay soils, 1 inch of water may reach only 3 to 5 inches in depth.

All of this water could be applied in one irrigation provided the soil infiltration rate is high enough. If the soil's infiltration rate is low and the irrigation water applied is too fast, water begins to run off to low areas instead of reaching the plant's roots.

Two solutions are available: Several companies now make low precipitation sprinkler heads that deliver water at lower rates than traditional sprinkler heads. Irrigation systems designed with low precipitation heads must have longer running times to compensate for their lower rates of precipitation.

The other solution is to split irrigation applications into several smaller cycles over a period of several hours. This gives a smaller amount of applied water a longer time to infiltrate the soil surface before running off.

Designing an irrigation system according to a manufacturer's specifications gives the highest uniformity of application. Deviating from these specifications by "stretching" the heads or spacing them further apart than recommended, leads to waste since some areas will be overwatered and others are underwatered.

Grass like tall fescue, which must be mowed at or above ½ inch for good appearance, needs to be irrigated with heads that extend three or more inches above the soil surface. Sprinkler heads must distribute the irrigation water above the top of the grass as the grass blades will block the sprinkler's spray pattern. This kind of interference causes uneven coverage and, like poor design, leads to water waste. □

Fertilizers containing slow-release nitrogen will be more expensive but may be applied less frequently at higher rates. Such application will help avoid summer applications of nitrogen.

In colder climates, nitrogen fertilizers applied just before the cold winter months (early November) extends turf color into winter. Early spring fertilizer applications (late January to February) aids spring green-up and turf recovery from winter loss of color.

If fertilizer is completely withheld or is inadequate, turf density will decrease. Its ability to recover from wear also diminishes. And its texture and appearance becomes more coarse.

With regular fertilization, the grass will maintain a deep green color and good density. Excessive fertilization should be avoided. It is wasteful and may contribute to groundwater pollution.

Because desert soils are generally alkaline (high pH), fertilizers supplemented with iron fertilizers need to be applied to correct turfgrass yellowing caused by iron chlorosis. Iron-containing fertilizers will prevent the problem if applied once or twice each season at ½ to ¾ lb. of iron per 1,000 sq. ft. or when chlorosis is evident.

Aerification needed

Tall fescue does not tolerate compacted soils as well as some other grasses. All soils growing grass, whether sandy or clay-like, need to be opened or perforated periodically. Aeration by core removal is recommended.

Coring to depths of 3 to 4 inches will allow irrigation water and air to penetrate the soil more easily. This will help avoid run-off and other waste. Slopes and areas of heavy traffic or play should be aerated frequently since water applied to these compacted areas runs off readily.

Remember that tall fescue, if watered properly and grown in light soils, can easily attain rooting depths of 3 to 4 feet. Aerifying also helps reduce thatch. Aerifying should be practiced during the fall months prior to overseeding.

When to dethatch

Power raking or dethatching is the physical removal of dead and accumulated fibrous, grassy material from the soil surface. Previously, thatch was not considered a problem on tall fescue turf.

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MANHATTAN	5.5
PENNFINE	5.5

Genetic Color	
COMPETITOR	7.0
FIESTA II	6.9
CITATION II	6.7
DIPLOMAT	6.5
MANHATTAN	6.5
PALMER	6.4
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tions have shown that significant amounts of thatch accumulate in tall fescue, so its periodic removal may become necessary.

Thatch is not considered a problem unless it accumulates to a depth of ½ inch or more. Up to this point thatch may benefit the soil environment through a mulching or cooling effect on the soil surface during the hot summer months. It also provides some cushioning from traffic.

When thatch accumulates too deeply however, it prevents water and air from reaching the root zone and provides an environment for insects and diseases. Grass roots begin to grow in thick thatch, increasing the turf's water needs during the summer.

When thatch becomes too thick, gradual removal over several seasons is necessary, accompanied by aeration to encourage deeper rooting. Dethatching is best when done in late summer or fall before overseeding. Do not dethatch in late spring or summer when the grass may be too slow to grow back.

Overseed in fall

Tall fescue lawns should be overseeded with 1 or 2 lbs. of tall fescue seed per 1,000 sq. ft. each fall. This practice will help to maintain a dense and thick lawn.

Fescues are bunch grasses that do not have the ability to fill in bare areas. Tall fescue turf that has been damaged by dog urine, chemical spills, wear or mechanical damage must either be reseeded or mended with sod. Overseeding in the fall helps to replace grass plants that have died from disease or insects, and keeps a lawn dense, healthy and vigorous.

Tall fescue does not tolerate compacted soils as well as some other grasses.

Pasture-type tall fescues, bluegrasses and ryes are not compatible as an overseeding into a turf-type tall fescue lawn and should not be used.

Pest problems

Tall fescue is relatively insect free. White grubs are the most difficult insect to control, though cutworms and sod webworms may also pose significant problems to tall fescue turf. Consult your local extension office or farm advisor for control recommendations.

The most serious tall fescue disease problems are brown patch, fusarium blight and pythium.

Brown patch usually occurs during the cooler spring and fall months on neglected, under-fertilized turf growing on wet or over-irrigated soils. Fusarium blight usually occurs during hot, dry, summer months under high fertility and in underwatered situations. Both diseases appear as a patchwork of brown spots in the lawn that may coalesce into larger, dead areas. The "frog-eye" spots usually attributed to fusarium may not appear on tall fescue turf.

Damage from fusarium appears as depressed or sunken patches in the lawn. Pythium usually occurs on newly established lawns from seed. This disease also appears as patches of dying grass but results from over irrigation. It can usually be controlled simply by reducing the frequency of irrigation.

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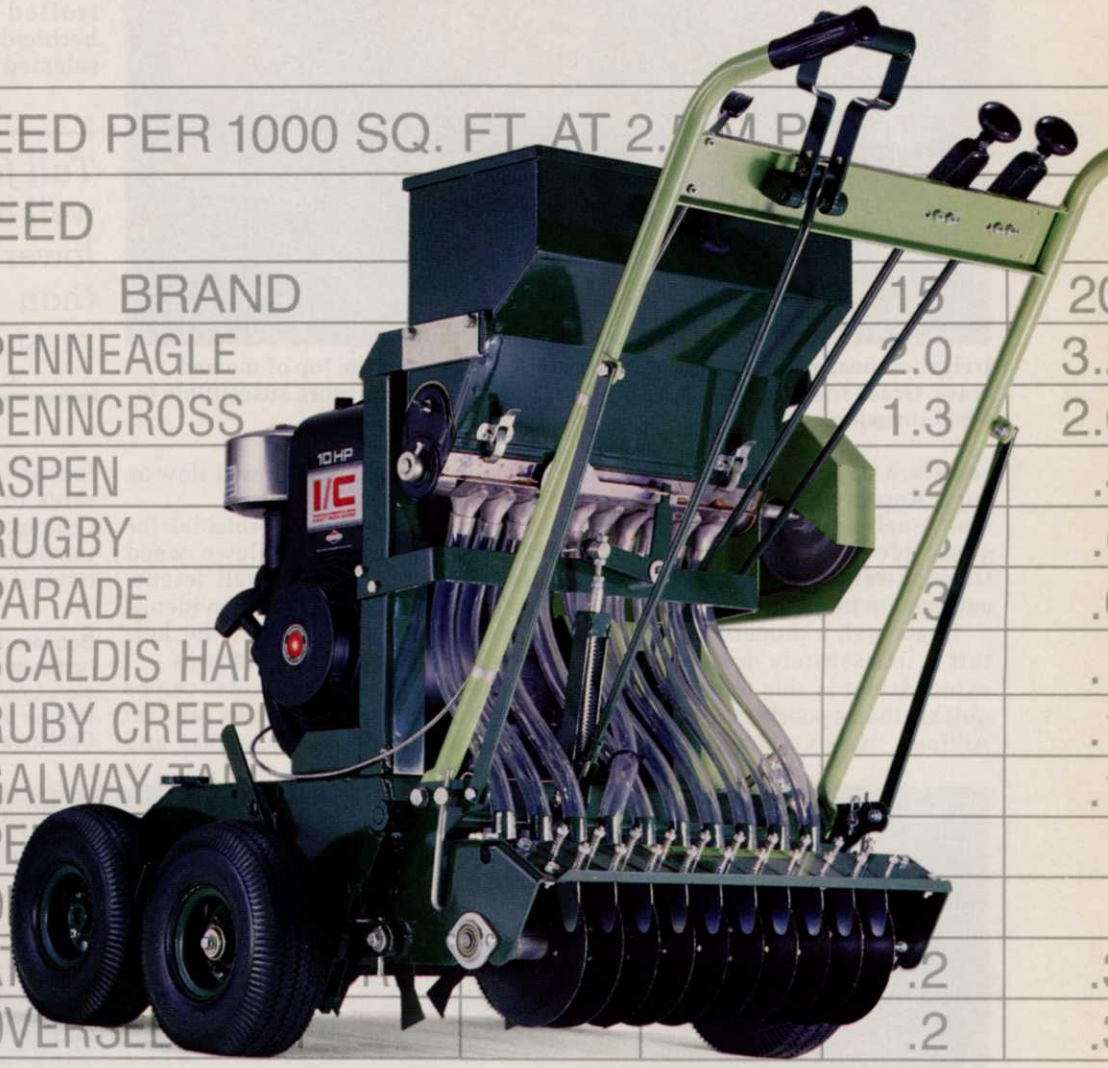

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Irrigation heads should rise high enough to spray over the top of mowed grass. Grass scalped around heads with line trimmers is more susceptible to weed invasion.

eases are easier to prevent than to cure. Recommended cultural practices, such as proper mowing, adequate fertilization, judicious and timely irrigations and frequent aerification help prevent diseases.

In general, a properly maintained turf is less severely damaged by diseases. And it is able to recover more quickly than a poorly maintained one. At times, merely a change in cultural or maintenance practices will slow or stop the disease.

Many of the same herbicides for bluegrass and ryegrass lawn weed control can be used on tall fescue. Make sure the weed has been identified correctly and consult the herbicide label for control measures.

Pre-emergence herbicides can be used in the early spring to prevent crabgrass, spurge, goosegrass and other summer annual weed species. If control has been poor, post-emergence crabgrass control chemicals can be applied to tall fescue during the early stages of the weed's growth.

Broadleaf weeds such as dandelions or mustards can be controlled with several available herbicides. Make sure the herbicide selected is approved for use on tall fescue and follow recommended rates to prevent herbicide injury. Contact your local cooperative extension office or farm advisor for control recommendations. **LM**

Tall fescue is well adapted to lower nutrient levels than required by most other turfgrass.

Bob Morris is an area extension specialist in horticulture at Nevada Cooperative Extension, University of Nevada, Reno. John Van Dam is a turf advisor at the University of California Cooperative Extension.

Tall fescue's bunch growing habit gives it a lower recuperative potential after damage to large areas. Overseed with 1 to 2 lbs. of seed per 1,000 sq. ft. each fall.

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by Ed Wandtke, CPA

Customers are not swarming to your company for services. Employees are turning over at a higher rate than ever. Productivity seems to be slipping off.

If these conditions are not happening in your company this year, you are an exception and in the minority in the green industries.

Why the sudden change of events? Psychologists have extensively researched the effect of work environment on the human component, the employee. Through this research, they have identified certain specific factors that influence productivity for the outdoor work industries. The three factors that appear to be specifically applicable to the green industries are physical, human and organizational.

For many jobs involving a lot of physical labor, a pattern of productivity emerges over a period of time. Influencing the worker are many factors that can cause a reduction or increase in his or her job performance efficiency. Some of the factors in the green industry are:

1. Customer interaction or the lack thereof;

2. Route scheduling efficiency;

3. Drive time to service customers;

4. Production quotas;

5. Service calls or re-treats; and

6. Equipment breakdowns.

Knowing this has led to our research into the productivity efficiency of employees in the lawn care or maintenance industries. The chart on the following page reveals the fruits of our labors:

From this daily productivity efficiency table, it is evident that employees who work longer hours per day may not produce the financial results that you might expect. In addition, we found that employees who were asked to work more than 10 hours for an indefinite period of time often "took a day off" to recover, relax or even look for a new job.

So how can you increase productivity and still retain your employees? Let's look at the three key factors that influence productivity in the green industry.

The amount of physical effort needed to perform all of a job's tasks will influence an individual's level of productivity. *Physical effort* is defined as exertion, lifting and weather.

Two industrial engineers, Frederick W. Taylor and Dr. Gilbreths, extensively evaluated the work in a job to determine if there was a more efficient method of performing the tasks. But when was the last time you went out to see your employees performing their tasks? Have you developed a system that all of your employees follow to complete their tasks? Do you let each employee do what is most comfortable for him or her?

Over the past 10 years in the green industry, I have found that many employees, left to their own devices, do not realize the most efficient methods to perform their tasks. Efficiency frequently is not achieved until an employee works on the same or closely-related job for up to three years.

Knowing this, I have advised our clients to develop a job task sequence list for each of their vehicles. Whether it is chemical lawn care—liquid or dry—or lawn mowing and property management, a list can be developed. By developing the work sequence and task split lists, you can achieve faster training time of new employees and less downtime on properties because someone is wondering what to do next.

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Circle No. 103 on Reader Inquiry Card

work sequencing for each day can also lead to increased productivity. For example, use non-work time to reach the farthest drive location in order to reduce "windshield time" later in the day as an individual or crew tires.

All companies in the green industry must recognize the effect of the weather on an individual's performance. Rain may make mowing very dangerous or difficult. Applying dry fertilizer in the fall or spring when the property has a fresh coat of dew may lead to the spreader or applicator tipping over. Wind and rain may keep a liquid lawn applicator from working. The heat of the summer frequently lowers production.

Yes, there is a relationship between the weather and production in many companies. Most companies, though, do not recognize many ideas that can help the employee stay on the job rather than quit at the sight of bad weather. Some companies are even able to increase productivity in the heat.

What is being done by those companies who are realizing this increase in productivity?

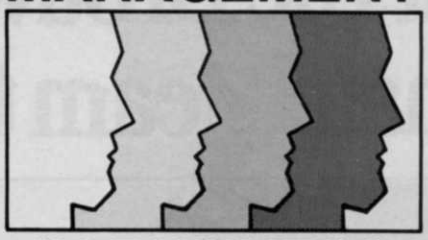
1. Companies are recognizing that liquid refreshment breaks in the field are as much needed as coffee breaks are needed in the office. Do you encourage your employees to take such a break? If an employee does not want to take the break, encourage him or her to. It will result in sustaining a higher work productivity level all day than for individuals who do not take the break.

2. Make your employees take a lunch break. This is not only a time to add nutrients to the body, but it can also serve as a refresher to the "will." The best lunch break is when employees eat out of the production vehicle. I encourage employees to go to a park or shaded area to sit down and relax while they eat their lunch. This will allow the individual to recover better, and it will help increase productivity after lunch.

3. Increase efficiency in getting your employees into and out of the office each day. Don't let the day go to waste because there is no plan when vehicles leave the shop or when they return. One of the most common reasons for inefficiency is the "stand-around-and-wait" routine. Whether this is morning or evening, tasks performed immediately after this delay frequently contain more errors or have been performed very carelessly. One way to avoid this is to have a plan for all individuals when they arrive each morning and then when they return in the evening. Have you checked your production employee area recently in the morning or evening?

4. Provide a cool container system in each vehicle so that the employee has a permanent place to store liquids. Many companies today are even providing the liquids in an effort to better attend to their employees' physical needs.

MANAGEMENT IN BUSINESS



The attitudes of a company will influence the productivity of its employees. As we saw during the Chrysler turnaround, Lee Iacocca told the employees and the world that they were winners. He went so far as to bet the company on his hunch. But you are not as large as Chrysler. How can what he did work for you? What *did* he do?

He told his employees that he believed in them. Speaking to all levels of employees in the company and being interested in what they have to say made the individuals feel like they were more than an employee. Do you take the time to speak to any of your employees as you meet them? Do you know their names?

He worked like his employees at improving the company for the long term. Being a salesman, he sold the image of Chrysler everywhere. What are your best skills? Have you used them as intensely as you can to improve the company? Do you or your managers ever take the time to work a day alongside your employees to realize how hard the work really is? Don't be too proud to do the physical work. Your employees will respect you and the company for your efforts.

Being an employee of "the new Chrysler Corporation" started to mean something. What have you done for your employees? Are there clean uniforms for all employees of the company? Do individuals feel good about working for your company? Have customers made comments about the quality of your employees?

Motivation of the work force needs to come from the top and be reinforced by every manager in your company. The higher the morale in a company, the higher the productivity of all employees. Keep your managers' attitudes positive and the feeling will spread through the company. In some instances, we have seen companies which have positive attitudes find that the total hours needed to service all of the customers shrinks. High morale in a company will also lead to fewer employee turnovers.

The Japanese and West Germans believe that productivity can be managed. But, in those countries, productivity is regarded by the individual as a personal responsibility. People and the organization are treated with great concern because they believe that "We must and will succeed." The success of these countries in increasing productivity and quality of work life must be judged in terms of their own principles, culture and lifestyle.

By developing the work sequence and task split lists, you can achieve faster training time.

Peter F. Drucker said in *Managing in Turbulent Times*, "...the employee on all levels, from the lowest to the highest, needs to be given genuine responsibility for the affairs of the plant." Participative management may have developed in the manufacturing industries, but it is applicabile to the green industries today.

Increased productivity must be addressed by all individuals in a company. Management should take the lead and be certain that the efforts are translated into meaningful actions once the course is identified. Here are some suggestions:

Bring your employees into your need for higher productivity. Seek their input. Implement it. Make your company the one customers want to provide their service and individuals want to work for.

You will hopefully reach your goal of employees coming to work for a company they really believe in and enjoy working for. **LM**

EMPLOYEE PRODUCTION

Hours on job	Productivity efficiency
Start to 4	100%
4 to 6½	75%
6½ to 8½	60%
8½ to 10	50%
More than 10	50%

Source: The author

Manhattan II helps smooth out the roughs at Inverness

INVERNESS CLUB, TOLEDO — Superintendent Tom Walker chooses Manhattan II to overseed roughs at this prestigious club because of its wear resistance, quick establishment, dark green color and drought and disease tolerance. But Tom finds Manhattan II's big plus is *density.* Manhattan II actually produces more leaves per plant, an economy sometimes overlooked.

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Late-season N improves turf quality all year

Research indicates a late-season nitrogen application improves turf quality year-round. This, according to Dr. John Clapp, agronomist with the Triazone Corp., speaking at the Southern Turfgrass Conference here.

"Late-season N on turf can prolong the fall/winter green-up period, increase root growth in the spring, decrease spring mowing, and improve the lawn's resistance to drought, disease, and weed pressure," Clapp says. "A dose of nitrogen in the late fall, after shoot growth has ended, helps keep the turf green until winter dormancy sets in. That eliminates the N deficiency that's so common by that time of year.

Timing—critical

"In the spring, green-up and root growth is promoted earlier, giving the turf a good start. That vigor pays off throughout the season in a stronger, denser lawn that is more resistant to insect and weed outbreaks."

"You have to be careful to time your application correctly," Clapp warned. "Apply your nitrogen after shoot growth has ended, but before the grass stops producing chlorophyll. That's usually when the temperature drops below 50°F, but before the turf turns brown."

Nitrogen applied too early could result in excessive topgrowth.

He noted that nitrogen applied too early could result in excessive topgrowth, which drains carbohydrates from the turfgrass' reserves, making them more vulnerable to winterkill. If you put on your N too late, Clapp says, the lawn will only be able to use the nutrients in the spring, after it comes out of dormancy.

Adjust rates

"Late-season fertilization isn't designed to add N to your program," Clapp explained. "You're not changing the amount of nitrogen you apply each year—you're simply adjusting the distribution times, applying more in the fall and less in the spring."

Clapp says research indicates that 1.0 to 1.5 lbs. N/1,000 sq.ft. is a good rate for late-season application. The other application rates should be reduced to avoid over-fertilization: Clapp recommends applying 0.5 to 0.75 lb. N/1,000 sq.ft. in the spring; 0.5 to 0.75 lb. N/1,000 sq.ft. in the early summer; and 0.75 to 1.25 lbs. N/1,000 sq.ft. in the early fall.

Too much late-season nitrogen causes excessive spring topgrowth and even mild cases of fusarium blight, Clapp warned, so don't exceed the recommended rates.

Controlled-release N works best for late-season application. Use a nitrogen source that doesn't rely on microbial activity, advised Clapp. He noted that using more traditional products for late-season fertilization can often lead to problems.

Urea, for example, has been found to leach out of the rootzone after late-season applications, particularly in sandy soils. Slow-release sources like IBDU and sulfur-coated urea are less prone to leaching, but provide a delayed response, so the applicator must do some guesswork in order to apply two to three weeks before the optimum time. For best results, Clapp recommended a nitrogen source like the patented triazone molecule in N-Sure nitrogen solution. Triazone's unique ring shape allows it to begin releasing nitrogen immediately, and continue feeding turf for weeks.

"A solution like N-Sure is ideal for late-season application because it spreads its nitrogen release over a long period of time," says Clapp. "It provides immediate visual enhancement, sustains the lawn into winter, and still provides enough nitrogen to provide better spring green-up.

"That makes a difference year-round. When grass comes up in the spring with good, healthy carbohydrate reserves, the pressures of weed infestation and disease decrease dramatically," he says. **LM**

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Bark mulch: an excellent soil conditioner

Shredded bark mulch is commonplace in the landscape and nursery industries.

When trees are dragged from the woods to the sawmill, they accumulate mud and stones. By using a debarker, this cleans off the debris of the trees without marring the wood that is milled for lumber. This in turn keeps the mill cleaner inside, and extends the life of the saw blades. Bark mulch is then accumulated on the grounds of the mill.

How did bark work itself from lumber mills into our particular industries? Nurseries, always seeking better and more economical ways to grow their plant material, saw a use for bark in potting media. Why? Because it is relatively low in cost and has favorable properties. This idea spread from potting medium to soil conditioner and also for use as a ground cover.

Bark uses have expanded to include soft surfaces under playground equipment, jogging trails, fuel for generators and bedding for animals. The most recent development is composting bark mixed with sewage sludge for use as a soil conditioner, potting medium, and topdressing for flower beds.

Bark mulch, such as this used at Edgell Communications headquarters in Cleveland, Ohio, is an excellent low-maintenance ground cover.

From whence it comes

Sawmills located throughout the United States produce lumber from species native to their geographical region. Different types of bark are produced with unique characteristics.

Cypress bark mulch is derived from mills in the Southeast. The cypress tree grows mainly in Florida and Louisiana. Cypress, unusually red in color, is naturally resistant to rot and decay. This product will retain its color for longer than any other species of bark mulches. In many cases the whole tree is ground up and marketed as bark mulch to meet the demands for this product in the landscape industry. Cypress mulch is graded on the amount of wood content in the mulch. The gradings range from A (the best, with the least amount of wood content) to C (this not only includes wood content, but some sawdust).

The northern species of trees similar to cypress is the cedar family. This species grows in Michigan, New York and southern Canada. Its color is not as brilliant as cedar, but is reddish. Since it is also resistant to decay and rot, it will last in flower beds for two to three seasons.

Another type of bark mulch available in the industry is pine. Many different species of conifers are used. Pine bark mulch can be very stringy and chunky. Many times it is marketed in mini-nugget or regular nugget forms. Since this material does not break down as fast as a hardwood material, the nurseries use it as a space filler for container growing.

The most common mulch comes from hardwood bark which is domestically produced and available in all the eastern and midwestern states.

Most common

The most common and readily available bark mulch is hardwood. Hardwood bark mulch is domestically produced and available in all the eastern and midwestern states. Hardwood bark mulch incorporates many different types of deciduous trees. It is light brown when fresh. Because hardwood bark mulch can also be stringy and chunky, many mills double-shred it to give a nice uniform size. Processed bark mulch breaks down much faster than the other types of mulch mentioned previously. The decomposition process turns the bark darker in color. This bark is the most popular in the landscape industry. The hardwood bark mulch fines (small pieces of mulch that fall through the screening material) are very useful for potting in container material.

Organic advantage

Bark mulch can be applied any time of the year. Spring is the most common, as flower beds are cleaned up and flowers are planted. One advantage of the bark mulch is that it is free of weed seeds and plant diseases. It is an organic material that decomposes to a humus and soil conditioner. It is safe and non-toxic. Bark mulch which has been spread around plants retains the soil moisture and enhances seed germination along with moderating soil and surface temperatures. This can help in the hot summer and also with frosts in the late fall.

One precaution to keep in mind is that aerobic and anaerobic decomposition occur. Heat is produced along with the possibility of a decrease in the pH. A way to remedy this problem is to let the heat dissipate from the bark. You can also help by watering the bark down and handling it with care around juvenile plants. **LM**

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Provides comprehensive coverage of complete planting, site analysis, preparation and special planting methods, fully detailed coverage of fertilization, irrigation and pruning guidelines on preventative maintenance, repair and chemical control, how-tos of diagnosing plant problems, practical data on noninfectious disorders, diseases, insects and related pests and pest management. **$56.00**

400 - NATIVE TREES, SHRUBS, AND VINES FOR URBAN AND RURAL AMERICA
by Gary L. Hightshoe
This award-winning reference to native U.S. plants has now been expanded to include shrubs and vines. Over 250 major species are characterized by form, branching pattern, foliage, flower, fruits, habitat, soil, hardiness, susceptibility, urban tolerance and associate species. Includes unique color-coded keys that classify plant species by visual characteristics, cultural requirements and ecological relationships. **$79.95**

720 - SHRUB IDENTIFICATION
by George Symonds
Pictorial key to identify shrubs. Contains more than 3,500 illustrations to check specimens. Popular and botanical names are given for each shrub and handy index tabs for quick reference.
$12.95 paperback

750 - TREE IDENTIFICATION
by George Symonds
Pictorial reference to identifying trees by checking leaves, buds, branches, fruit and bark. Like its sister publication, SHRUB IDENTIFICATION, popular and botanical names are listed with index tabs for easy reference.
$14.95 paperback

755 - TREE DETAILING
by Michael Littlewood
A compendium of practical information on all aspects of tree planting and maintenance. 10 chapters deal with tree stock and sizes, planting techniques, pruning and surgery, protection of new trees and existing trees, maintenance and management, survey and evaluation. **$32.95**

760 - TREE MAINTENANCE
by Pascal Pirone
The fourth edition of this guide for anyone involved in the care and treatment of trees. Special sections on tree abnormalities, diagnosing tree troubles, non-parasitic injuries and assessing the suitability of different trees. **$49.50**

405 - WOODY ORNAMENTALS
by Partyka, Joyner, Rimelspach, Carver
Illustrates plant identification characteristics. Organized in two basic sections: plant identification and plant disorders, this text utilizes 430 color photos, 430 line drawings and 45 black and white photos to simplify identification.
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NEW! Instructional Videos!

01 - PROFESSIONAL SOD LAYING TECHNIQUES - 25 minutes - Color - VHS - $85.00
"How-to" video featuring step-by-step guidelines for installing sod professionally. Illustrated reference guides and group study materials included.

02 - PLANTING AND STAKING LANDSCAPE TREES - 20 minutes - Color - VHS - $85.00
Award-winning infie!J demonstration video covers the key steps of planting landscape trees. Illustrated reference guides and group study materials included.

03 - SUCCESS WITH BEDDING PLANTS - 25 minutes - Color - VHS - $85.00
Shares those "tricks of the trade" used by national award-winning professionals. Shows how to select, install and maintain bedding plants successfully. Illustrated reference guides and group training materials included.

04 - WORKING WITH PESTICIDES - 2 45 minute videos - Color - VHS - $143.95
This video safety course covers Pesticide Labels, In-field Clothing & Equipment, How to Be Prepared for a Spill, Tips on Mixing and Calibrating Pesticides and more.

05 - PROFESSIONAL TURF MANAGEMENT - 30 minutes - Color - VHS - $85.00
Examines nine major warm and cool season turf varieties. Optimum mowing heights and cutting frequency are given each turf variety. Illustrated reference guides and review test included.

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Step-by-step instructional video for infield employees covering Sprinkler Heads/Drip Emitters, Electrical/Manual Valves, Backflow Prevention Devices, Controller Operation and more. Illustrated handbook included.

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Volume One covers four important methods of propagation: by seed, division, bulbs and tubers and micropropagation. Volume Two covers three additional techniques of propagation: cuttings, layering and grafting and budding. Study guides included.

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Available in English or Spanish. Best-selling video developed for entry level industry training presents in-the-field demonstrations of The Techniques of Thinning Out Pruning, How to Control and Direct Plant Growth by Selective Pruning, How to Prevent In-Field Injuries and more. Illustrated reference manual and reproducible group study guides included.

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Prices subject to change.
Quantity rates available on request.

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Questions? Call 218-723-9471 or 9472 LM

Lawn sweeper keeps debris under cover

The Sweep-A-Lawn from Parker Sweeper Company keeps grass, leaves and other debris from being thrown to the wind.

A new wind apron is secured by elastic cords attached to the upper basket rod with hooks on each side of the basket.

Parker says the Sweep-A-Lawn is ideal for small to medium size lawns, and can be used as a push or trailing sweeper. The trailing sweeper requires an optional hitch.

Sweeping width is 30 inches, and the basket capacity is 4.4 cubic feet.

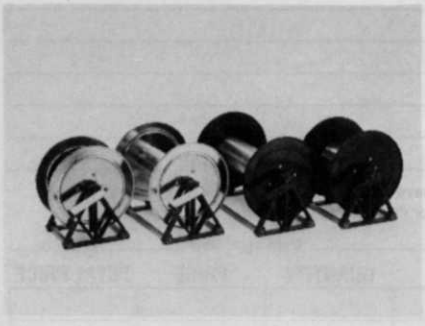
Circle No. 201 on Reader Inquiry Card

Hose reels withstand temperature, chemicals

Steel Eagle company of Elk Point, SD has announced the introduction of its Eagle line of hose reels.

The company says an "almost indestructible material," Nyprim 1500, was selected for the one-piece frame. This nylon material is strong without being heavy and withstands moisture, corrosion and high temperatures. The lubricating properties of Nyprim 1500, when combined with the stainless steel spindle create a low friction and low maintenance roller assembly. A spring loaded lock is molded into the frame to prevent free rotation during travel, along with a friction clamp which can be adjusted to limit free rotation.

The Steel Eagle reels have a center



spindle manufactured of high grade stainless steel pipe. A 3000 psi-rated hydraulic hexagon swivel is used to eliminate hose bending.

Circle No. 202 on Reader Inquiry Card

Zero-turning-radius unit maneuvers well

Ransomes, Inc. has introduced a new zero-turning-radius mower that combines superb maneuverability with a 50-inch cut. The new Twin Trak mower has been engineered for extreme productivity.

The Twin Trak maneuvers in and

out of the tight spots. The rear discharge to grass collector design allows close trimming on both sides of the mowing deck.

As an added feature, the operator's seat is positioned to allow a clear view of both sides of the deck at all times.

Ransomes says the Twin Trak's exlusive "positive feed" grass collection system adds further to mowing productivity. The unique design assures that even the heaviest clippings are deposited in the 8.2 bushel collector.

Circle No. 203 on Reader Inquiry Card

Non-clay carrier is now available

Edward Lowe Industries has begun production of Biodac, a non-clay carrier for use in the agricultural chemical industry and home fertilizer market. According to company news, the carrier offers significant advantages to producers and formulators over traditional products such as clay and corncob carriers.

Biodac is produced from organic fibers and is biodegradable. Because the product is chemically inert it does not require deactivators or preformulation conditioning. It can be custom designed to meet a broad range of parameters, which include bulk density, very narrow or broad particle size distribution and pH.

Circle No. 204 on Reader Inquiry Card

Wetting agent improves water use efficiency

Kalo, Inc. of Overland Park, Kan. is now marketing Hydro-Wet TG Granular, a combination soil and turf wetting agent and soil conditioner.

Hydro-Wet TG can be used by golf course, landscape, lawn care and sports turf professionals.

The improved granular contains 22.5 percent Hydro-Wet wetting agent on a Terra Green montmorillonite granule. Kalo reports that Hydro-Wet TG reduces the surface and adhesive tensions of water, thus improving water use efficiency.

Hydro-Wet TG Granular is packaged in a 50 lb. box. For most turfgrass applications, Kalo recommends an annual rate of 5 lbs. per 1000 square feet.

Circle No. 205 on Reader Inquiry Card

Landscape fabric is long lasting

Easy Gardener of Waco, Texas has introduced the new Weedblock 6+ Commercial Landscape Fabric.

The company says accelerated weathering tests show this heavier fabric will last six years when fully exposed to sunlight.

Weedblock 6+ is available in 250-foot rolls and widths up to 12 feet.

Circle No. 206 on Reader Inquiry Card

Mower deck makes clippings miniscule

Excel Industries has introduced the Turbo Shredder mower deck that chops grass clippings into fine particles. The particles then return to the soil surface easier and faster than is possible with standard mower designs. According to Excel, the shredding action of the Turbo Shredder

improves decomposition of the clippings and returns valuable nutrients to the soil.

Certain death for the dinosaurs.

The new Jacobsen Tri-King 1684D makes heavy cumbersome 84″ mowers things of the past.

Jacobsen ushers in a new age in heavy-duty 84″ triplex mowing with a truly lightweight, highly maneuverable package. So now you can say goodbye for good to those costly, one-ton monsters the competition turns out.

Lightweight and compact, this agile, rear-wheel steering machine maneuvers around trees and other obstacles in a hurry. A foot-controlled hydraulic lift with automatic reel shutoff makes cross-cutting fairways and striping sports fields quick and easy. Plus, the wide 10″ overhang simplifies trimming around traps, while optional on-demand 3-wheel drive smoothes out tough hills. And the Jacobsen Tri-King maintains a productive mowing speed in 3-wheel drive, so it trims circles around bulky, sluggish would-be competitors.

Simple, cool-running hydraulics deliver exceptional control of cutting frequency. This smooth, consistent power and a choice of 5- or 10-blade fixed or floating reels produce a uniform, carpet-like cut — even in dense, wet grass. Unlike heavier competitors, the 1684D's balanced, lightweight design and wide tires minimize turf compaction. And optional easy-on/easy-off grass catchers make clean-up a breeze.

A liquid-cooled 16.5 hp diesel provides plenty of power with longer life, simpler maintenance and better fuel economy.

Or choose the 1671D, a unique, durable 71″ triplex with all the same quality features of the 1684D. Yet smaller reels cleanly cut tricky undulating terrain and those really tight spots.

Don't be saddled with a dinosaur of a triplex when you can have the advanced new 1684D. Ask your Jacobsen distributor for a demonstration today. Attractive lease and finance plans available.

Jacobsen Division of Textron Inc., Racine, WI 53403.

JACOBSEN
TEXTRON
Jacobsen Division of Textron Inc.

Circle No. 117 on Reader Inquiry Card

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J-5-9

PRODUCTS *from page 72*

Excel says the Turbo Shredder's eight-blade design eliminates clogging and increases air flow for better dispersal of clippings. When shredded grass clippings are collected in the eight-bushel Bac Pac grass catcher, less air is trapped in the catcher so the grass is more densely packed.

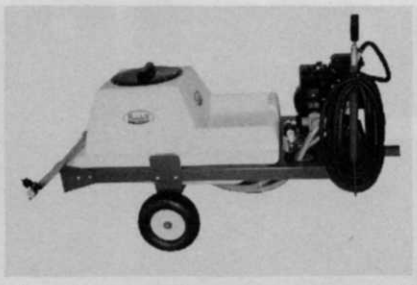
The Turbo Shredder 51-inch deck became standard equipment on all Hustler 251K models in late July 1989. The 251K is an 18-hp dual hydrostatic mower that provides the ultimate in maneuverability and true zero radius turning.

Circle No. 207 on Reader Inquiry Card

Lawn, garden sprayer holds 30 big gallons

The Broyhill Company has designed a new 30-gallon lawn and garden sprayer with an exclusive low profile tank design and 10-inch easy access lid for convenient tank rinsing.

The tank holds 20 percent more capacity than standard 25 gallon sprayers, according to Broyhill. The unique design has a garden tool/



chemical container storage area with drain to eliminate rain collection. The unit can be towed with the engine in the front or rear for less operator noise. Standard equipment includes spray gun, by-pass agitation, relief valve, 80-inch coverage boom, filter, 150 psi roller pump and 3 hp Briggs & Stratton engine. All controls are mounted on the spray gun holder for easy operating.

The 30-gallon frame will accept a 60-gallon tank with similar configuration and will feature larger flotation tires.

Broyhill also reports that the 30-gallon unit's design will allow a 48-ft. semi-trailer to hold 24% more spray units than comparable spray models.

Circle No. 208 on Reader Inquiry Card

Boring system for utility line work

The Charles Machine Works, Inc. has added the True Trac extended range guided boring system to its product line. The compact system has been developed for trenchless installation of utility lines in various soil conditions, including solid rock, according

to Mark Kern, product manager.

"There is a rapidly growing market need for a guided boring unit that can work in congested or landscaped areas where conventional excavation methods are not feasible or desirable," says Kern. "The True Trac guided boring system can be used to install new or replace existing lines, with minimal soil disturbance."

The company says the True Trac's surface-launched downhole tools can bore four- to six-inch holes to distances of 600 feet. Two steerable downhole tools are available: a pneumatic percussion tool based on the Pierce Airrow pneumatic piercing tool, is used in compactable soils. A positive-displacement, steerable air motor drill is available for boring through rock.

It is operated by a three-man crew.

Circle No. 209 on Reader Inquiry Card

Disease detection kit works in 10 minutes

Agri-Diagnostics Associates has developed the Reveal brand of 10-minute turf disease detection kits for golf course superintendents and other lawn care professionals.

Based on immunoassay technology from the medical diagnostics field, on-site tests contained in a kit for each

disease allow detection of pythium blight, brown patch or dollar spot, even before symptoms occur, according to Agri-Diagnostics.

Circle No. 210 on Reader Inquriy Card

New injector system for insect control

Cross Equipment Co., Inc. of Albany, Ga. has developed Injektaspray, for control of sub-surface insects.

Injektaspray consists of a combined low pressure (30-40 psi), low height topical spray application followed by a high pressure ground surface injection of 2000 psi. The low pressure system follows conventional design criteria, using a centrifugal pump to generate pressure through conventional boom and tip configuration. The low height system reduces environmental exposure to the air and can be used independently or simultaneously with the high pressure system.

The high pressure system consists of a high pressure piston pump. The pesticide is injected directly into the turf and soil using straight stream nozzles injecting continuously through orifices in a stainless steel shield pan. The depth of injection ranges from 1/4-1 1/2 inches, depending on soil compaction.

Circle No. 211 on Reader Inquiry Card

Herbicide gets EPA green light

Confront herbicide has received EPA registration for control of annual and perennial broadleaf weeds in ornamental turf and cool season grasses.

The product, developed by Dow Chemical, is composed of an amine salt formulation containing one part clopyralid to three parts triclopyr per gallon. Both active ingredients act as a plant hormone mimic, disrupting plant cell growth. According to Dow, initial control results are noticed four to six days after treatment, with full results occurring in the ensuing weeks.

"Each active ingredient in Confront controls a variety of weeds," says Rob Peterson, turf product marketing manager. Triclopyr controls ground ivy, oxalis, spurge, violets, chickweed, speedwell and others, while clopyralid controls such weeds as musk thistle, clover, dandelion and plantain.

Dow believes Confront offers consistently superior efficacy and single application elimination of many hard-to-control broadleaf weeds. It also uses significantly less active ingredients per acre to provide control.

Circle No. 212 on Reader Inquiry Card

continued on page 76

LANDSCAPE MANAGER OF THE YEAR

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LANDSCAPE MANAGEMENT

1988 Landscape Manager of the Year
Roy Peterman

Entry forms are now being accepted by the Professional Grounds Management Society and LANDSCAPE MANAGEMENT magazine for their third annual "Landscape Manager of the Year" award.

The purpose of the award is to recognize superior job performance among landscape managers, to challenge those involved in the industry, to achieve higher standards of excellence and to bring national recognition to deserving managers.

Any person directly responsible for the professional maintenance of one or more landscapes is eligible to enter. Applicants will be judged according to job performance, honors and awards, procedures and philosophies, and contributions to the green industry. Applicants will be asked, at the time of entry, to submit four 5 x 7 black-and-white glossy photos and 10 color 35mm slides of current work areas with a short narrative on each.

(clip and mail)

Applicant's name **Title**

Applicant's company

Official entry form should be sent to:

Name **Title**

Company

Address **City/State** **Zip Code**

Mail to: PGMS, Landscape Manager of the Year,1201 Galloway Ave.,Suite1E, Cockeysville, MD 21030, 301-667-1833

PRODUCTS *from page 74*

New system works with multiple tools

The Green Machine's Expand-It 2800 system for the professional market uses a single power head with multiple landscaping tools: string trimmer/brush cutter, edger, weeder/cultivator, leaf blower and snow thrower.

Charlie Scoggins, director of campus landscape for Mississippi State University, says the Expand-It system is a money saver. "The all-in-one concept of the Expand-It allowed us to replace a number of machines with

just one unit. Now our crews use only one piece of equipment to do a number of jobs that each used to require a separate machine."

Circle No. 213 on Reader Inquiry Card

Legwear is designed for multi-applications

Leggins' from Bata Shoe Company, Inc. are lightweight yet durable leg coverings worn during chemical or water spraying.

They provide excellent tear and abrasion resistance while remaining flexible in temperature extremes.

Leggins' have stitched and taped seams that are strong and 100 percent waterproof.

A take-up snap provides a snug fit around the ankle. Belt loop straps are made of non-conductive, non-corrosive hardware.

Circle No. 214 on Reader Inquiry Card

Bayleton gets DFA OK in California

The California Department of Food and Agriculture has accepted registration of Bayleton 25 Turf and Ornamental Fungicide from Mobay Corporation, for prevention of Southern blight in turf.

The California label has been ex-

panded to include additional ornamental plants and trees. The label expansion includes powdery mildew control on oak, sycamore and viburnum, and rust control on willow.

Circle No. 215 on Reader Inquiry Card

Disc-style chipper makes debris disappear

Bandit Industries has introduced the Model 90 Tree and Brush Chipper. The Model 90 is a 9-inch capacity, hydraulic feed, disc-style chipper. It will convert trees and brush up to 9 inches in diameter into a very dimen-

sional woodchip that can be used for a number of different markets.

The hydraulic feed system reduces chainsaw work, in that it will crush and feed material into the chipper.

The 90 is a rear-feed unit with 360° swivel discharge spout. It is powered by a 30-hp Wisconsin gasoline engine or a 40-hp Hatz diesel and weighs approximately 2,450 lbs.

The Model 90 feeds material through the chipper at the rate of 90 lineal feet per minute. Also available as a PTO drive unit; a 3-point hitch or trailerized.

Circle No. 216 on Reader Inquiry Card

Special bag attachment for better grass pickup

The self-propelled Rear Bagger lawn mower by Sarlo features a special bag designed to powerfully pull grass in, and a strong self-propel action.

The mower is designed with a bag that is composed of three lightweight mesh materials. The material actually "breathes," creating a high vacuum by the turning blade, which pulls in the grass. The bag expands as it fills so that grass is distributed evenly.

Sarlo says the bag keeps dust particles away from the operator's face and eyes.

The mower is available with four and five hp engines.

Circle No. 217 on Reader Inquiry Card

Turf tool repairs damaged greens

Miltona Products of Miltona, Minn. has introduced the Sod Slide, a new tool for repairing greens damaged by oil or other liquid spills, winter kill or

vandalism. It cuts out the damaged sod and replacement strips. Available in three, five and seven inch sizes.

Circle No. 218 on Reader Inquiry Card

STILL WATERS RUN $TEEP.

Nothing's more aesthetically pleasing to any landscape treatment than a lake or pond. And nothing ruins a beautiful lake more than dirty, algae-ridden water.

The Otterbine® Aerator is an economical and beautiful way to keep water clean. Available in a variety of sizes and spray patterns, the Otterbine Aerator is easy to install and dependable—perfect for golf courses, commercial and recreational use and retaining ponds.

Don't be misled by fountains or nozzles that claim to aerate the water. *Designed* for aeration, an Otterbine can pay for itself thru the savings you'll have from not having to repeat costly chemical treatments.

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Circle No. 102 on Reader Inquiry Card

Narrow width tamper to reduce 'settling'

The TC4 "Sticher" by Vermeer Manufacturing Co. has been designed to restore narrow trenches and better reduce "settling" problems. The lightweight, self-contained unit combines the proven compaction aid of vibratory force with a rugged static compacting wheel for more positive restoration results.

Vermeer says the all-hydrostatic

"Sticher" is simple to operate and easily outperforms ineffective hand tampers or make-shift methods that use expensive backhoes to "mash" soil.

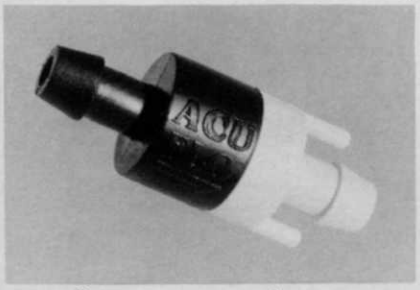
Compaction can be applied at any level down to 26 inches. Variable width pads (4-, 6-, and 8-inch/10-, 15- and 20 cm) and style let you match the "Sticher" wheel to specific conditions.

Circle No. 219 on Reader Inquiry Card

Micro flow regulator for micro-sprays

The Wade Rain Acu-Flo is a micro-irrigation flow regulator for use with micro-sprays.

Acu-Flo is factory preset to deliver constant flow over a wide range of pressures. Independent testing results show that Acu-Flo is accurate in flow rate with a coefficient of uniformity



exceeding 97 percent for pressures ranging from 20 to 50 psi.

Acu-Flo is currently available in nominal flow rates of 6.5 and 12 gallons per hour. Other standard flow rates are in development, and custom flow rates may be made available by Wade Manufacturing.

By installing Acu-Flo at each micro-spray, localized flow control eliminates variances created by long or under-sized laterals, elevation differential, pump or water table changes or other causes.

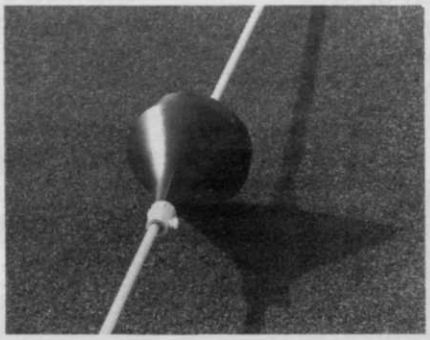
They are made of high-grade, industrial silicone to insure immediate regulation instead of a "break-in" period as with other materials. According to Wade, silicone also gives long-term regulation without deterioration, even in the harshest temperature and chemical environments.

Circle No. 220 on Reader Inquiry Card

Pin attachment talks to golfers

The GreenSaver is the first device that tells golfers to take care of the greens.

Made of lightweight plastic and aluminum, the GreenSaver is activated when the pin is placed at a 45° angle: a recorded voice advises golfers to "Repair your ball mark." After the message is delivered, the voice does not reactivate until the next group



plays through, approximately two minutes later.

Inventor/golf pro Rick Whitfield tested the GreenSaver on seven courses in south Florida. He reports a 40 percent increase in golfers repairing their ball marks.

Circle No. 221 on Reader Inquiry Card

New line of auto-injection system

Lesco, Inc. has introduced a new and complete line of automatic injection systems for the application of fertilizers, micronutrients and surfactants through an irrigation system.

The Lesco Microfeeder Injection Systems are four models designed to microfeed golf courses, parks, cemeteries, nurseries, athletic fields and other large, irrigated turfgrass areas by providing frequent, low-rate product application.

All systems utilize diaphragm pumps ranging from 3.4 GPH at 142 psi to 41.0 GPH at 142 psi. Three of the systems have flow meters and electronic microprocessors to accurately vary the pump rate and provide constant water-to-nutrient or water-to-surfactant ratios.

Circle No. 222 on Reader Inquiry Card

CORRECTIONS

Quail Hollow, other minor gaffs

Quail Hollow, A Club Resort, is owned by Club Resorts Inc. and not by Club Corporation of America, a sister company, as reported in the May issue of LANDSCAPE MANAGEMENT magazine.

One other inaccuracy appeared in that article, arising because of a delay from the time of writing to the time of publication:

Joseph Lucko left Quail Hollow as general manager to become general manager at another Club Resorts property, The Inverrary, A Club Resort, in Fort Lauderdale, Fla. The present GM is Michael Srdjak.

Club Resorts Inc. owns and/or operates five other properties.

Also, June's Project Profile, *"A Flowerful History Lesson"*, failed to mention the names of the contributing photographers.

Gordon Helman, coordinator of Horticulture and Forestry Projects for the city of New York and the man responsible for supplying us the information on the projects discussed, says Jane Schachat, Donna Pressley and Simon Bennepe brought us the attractive pictures.

In that same issue, associate editor Terry McIver's story *"Planning for Progress"* was presented incorrectly. What was page 50 should have been page 48, and vice versa. We apologize for whatever confusion this may have caused our readers. □

For thousands of softball addicts, sun worshippers and assorted nature lovers, your park is their backyard. What makes you think you can handle a turf test this tough?

Lebanon
TOTAL TURF CARE
A division of Lebanon Chemical Corporation

Circle No. 108 on Reader Inquiry Card

CLASSIFIEDS

RATES: $1.20 per word (minimum charge, $35). Bold face words or words in all capital letters charged at $1.45 per word. Boxed or display ads: $100 per column inch-1x (one inch minimum); $95-3x; $90-6x; $85-9x; $80-12x. (Frequencies based on a calendar year). Agency commissions will be given only when camera-ready art is provided by agency. For ads using blind box number, add $15 to total cost of ad. Send ad copy with payment to Dawn Nilsen, LANDSCAPE MANAGEMENT, 1 East First Street, Duluth, MN 55802 or call 218-723-9505. Fax Number 218-723-9615.

BOX NUMBER REPLIES: Mail box number replies to: LANDSCAPE MANAGEMENT, Classified Ad Department, 1 East First St., Duluth, MN 55802. Please include box number in address.

BUSINESS OPPORTUNITIES

In Mid-Western Wisconsin: Well established landscaping business averaging 110K per year, located in rapidly growing city, 45 miles East of Mpls., St. Paul. Includes all landscaping equipment, vehicles, nursery stock, snowplowing business, etc. Also includes 5 bedroom home on 3 acres with buildings, spa, swimming pool, fireplace. **Great Opportunity.** $179,000. 715-235-7307. 8/89

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WANTED TO BUY OR SELL a golf course? Exclusively golf course transactions and appraisals. Ask for our catalog. McKay Golf and Country Club Properties, 15485 N. East Street, Lansing, Michigan 48906. Phone (517)484-7726. TF

CURB KING: Curbing machine that lays continuous concrete landscape borders. Low investment, high returns. For information call 303-434-5337 or write PO Box 40567, Grand Junction, CO 81504. 9/89

HELP WANTED

Proturf Technical Rep

Scotts Professional Division is seeking qualified candidates for the position of ProTurf Tech Rep within it's national sales force.

Tech Reps are responsible for the sale, promotion, and servicing of Scotts commercial ProTurf products to those professionals responsible for the management of large turf areas such as athletic fields, college campuses, and lawn care service companies. Tech Reps specialize in product knowledge and agronomic expertise to recommend and sell the Scotts ProTurf product line.

The ideal candidate will have a college degree in turf management or agronomic science and turf related job experience.

Scotts offers an excellent starting salary plus incentive and a comprehensive benefit program including profit sharing. Interested candidates should send a resume with current salary level in confidence to: **Corporate Human Resources, O.M. Scott & Sons Company, 14111 Scottslawn Road, Marysville, Ohio 43041.**

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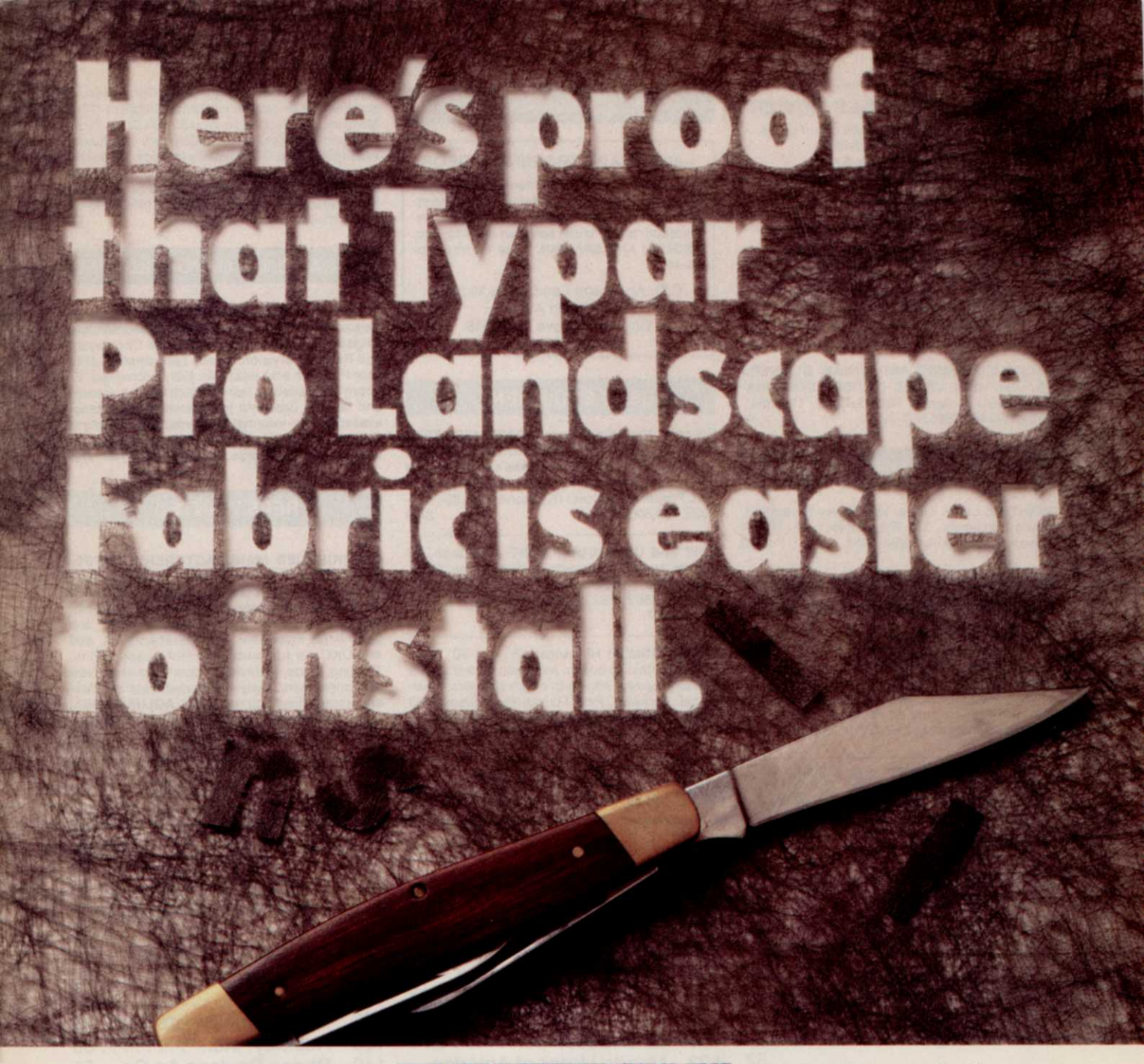

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PROBLEM MANAGEMENT

by **Balakrishna Rao,** P.h.D.

Controlling mice under snow

Problem: *Our landscape plantings are often damaged by mice in the winter. How can they be controlled? (Illinois)*

Solution: Mice can cause extensive damage to landscape plants during winter months. Their activity appears to be greater around plants covered with heavy mulching or with lots of low growing plants. Therefore, keep mulch around trees no more than 2/3 of an inch high.

Mice damage trees by pruning roots, girdling the roots and trunk and by burrowing in the soil. The culprits are usually one of three species: meadow, prairie and/or pine mouse. To identify which, examine the length of the tail. Pine mice have a tail about the same length as their hind feet. Meadow and prairie mice have tails about twice the length of their hind feet. In addition, these latter two mice have rough grizzled-appearing fur, while pine mice fur is smooth.

Managing ground vegetation with mowers, digging or using sod-chopping machines will help minimize mouse activity by reducing the cover for their surface runways. After this operation, remove any debris within a three-foot radius of the tree's base. Where feasible, kill the vegetation around the tree base.

Sunken cans can make effective, safe mouse traps (often called pitfalls). To make pitfalls, punch holes in an empty can's sides from the middle to top. Set the cans in the soil at ground level and fill them with water to the lowest holes. Place these near the back of trails or mice runways. If there is no vegetation cover for the mice to hide in, place a board over the can. Periodically check and empty the cans.

Your local cooperative extension personnel may have additional recommendations for mice control, such as rodenticides or more sophisticated bait stations.

Blight: legacy of hurricane?

Problem: *I recently heard that there is a serious blight on hemlocks in the Connecticut area brought about by hurricane Gloria. Is this possible? (Connecticut)*

Solution: I am not familiar with any report specifically suggesting the possibility of serious blight disease brought about by hurricane Gloria. It is more likely that Gloria's winds resulted in trees breaking and consequently declining.

Severe storms can stress and pre-dispose hemlock to some canker, causing fungal diseases. Perhaps the problem you are describing is related to one or more of these canker diseases. Contact your local cooperative extension personnel for further help in diagnosis.

Cankers are slightly sunken, discolored areas on the trunks and/or twigs. Small fruiting bodies may be produced as the cankers mature. A rain splash is often all that is needed to spread the disease to healthy plant.

Most cankers can be minimized by selective and prompt pruning of affected plants parts when dry. Afterward, disinfect pruning tools with Chlorox, Lysol or rubbing alcohol to minimize the spread of disease.

Copper fungicide treatments are recommended in the literature to manage canker, but I'm not sure how good a result one can expect with this method. Keep the trees healthy by proper pruning, watering, fertilizing and by providing pest management as needed.

Stopping zoysiagrass

Problem: *How do you eliminate zoysiagrass, or at least stop it from spreading from one lawn to another? (Pennsylvania)*

Solution: There is no herbicide designed for selective removal of zoysiagrass. Therefore, use a nonselective herbicide like Roundup to kill the existing green plants.

Make sure that the zoysiagrass plants are green and actively growing and wait 7 to 10 days after the first treatment to re-treat as needed.

If your objective is to stop zoysia from spreading from one lawn to another, consider using some physical barriers like landscape plastic borders. Even in this case, Roundup can be used if browning after treatments is not a major concern.

How to obtain manuals

Problem: *In your July, 1988 column you recommended the book Tree and Shrub Transplanting Manual, by E.B. Hemelick. We have tried to order this book for our library, but were told it is not available.*

Could you provide us with further information about this book so that we can purchase it for our patrons? (Iowa)

Solution: Thank you for your interest. You can purchase the manual by writing to the International Society of Arboriculture, P.O. Box 71, Urbana, Ill. 61801.

Balakrishna Rao is Manager of Technical Resources for the Davey Tree Co., Kent, Ohio.

Questions should be mailed to Problem Management, LANDSCAPE MANAGEMENT, 7500 Old Oak Boulevard, Cleveland, OH 44130. Please allow 2-3 months for an answer to appear in the magazine.

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